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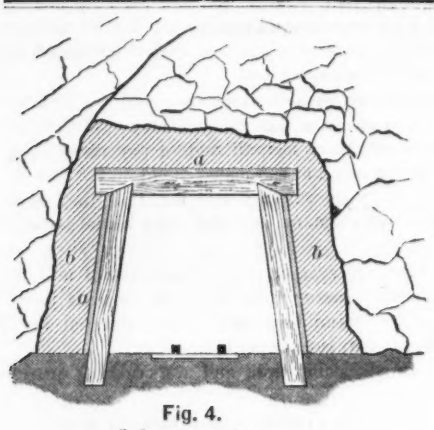


Fig. 4.
Scale, 8 Feet=1 inch.

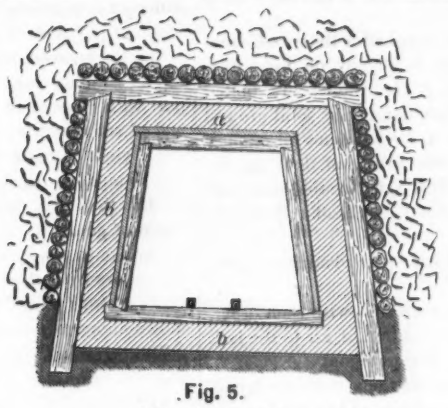
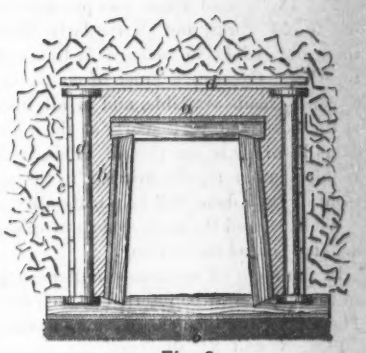


Fig. 5.
Scale, 8 Feet=1 inch.



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Scale, 8 Feet=1 inch.

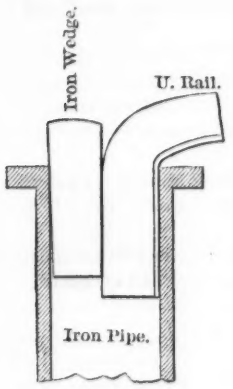

Fig. 7.

Fig. 8.
Scale, 8 Feet=1 inch.

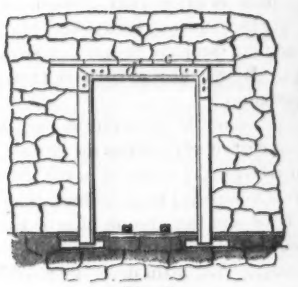

Fig. 9.
Scale, 8 Feet=1 inch.

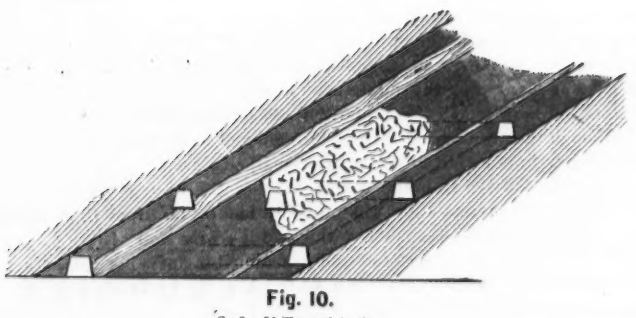

Fig. 10.
Scale, 50 Feet=1 inch.

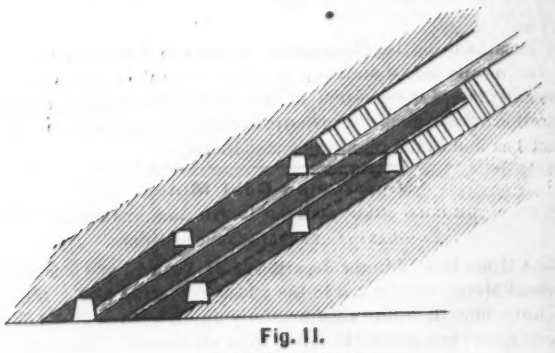

Fig. 11.
Scale, 50 Feet=1 inch.

The Midlothian Colliery, Virginia.*

By OSWALD J. HEINRICH.

(CONCLUDED FROM PAGE 146.)

IN old pits it will often be as profitable to drive a "rock lead" in roof or floor, if the rock is a slate or soft sandstone, as to use cased levels, if all sides have to be cased. In such cases I have found the rock-cutting nearly as cheap as the casing, particularly since it requires no further attention or repairs. Circumstances must be the guide; a little calculation will soon show the difference.

Where casing is unavoidable, the following descriptions and accompanying drawings will give a guide. (The same letters apply to all the diagrams).

*A Supplementary Paper, read at the Meeting of the American Institute of Mining Engineers, Philadelphia, May 21, 1873.

Fig. IV. Used in "rock-tumbles," liable to heat on account of loose coal or gob below the rocks. (*a*) is a two-inch plank, (*b*) a packing of clay, 18 inches to 2 feet thick, well packed and loaded on top with loose rock. The clay must generally be somewhat sandy, to prevent cracking; it should not be too wet; the consistency of putty is best. The greatest attention is to be paid to this tedious but most important part of the work. If badly executed, it is worthless. By putting the planks behind the timber, a closer job is effected. In less important instances, however, where no immediate danger of fire was anticipated, packing behind and round the timber, and spiking planks in front of the same, has been used. But it will generally give way in time, and can only be used occasionally.

Fig. V. has to be used in running ground, of loose, fine coal. It is necessary here to use double timbering, on account of the "fore-poling;" small sets of

6-inch timber inside are sufficient. This casing will answer when the loose coal is not already too strongly heating; otherwise, use the following.

Fig. VI. is employed in loose coal, almost on fire. (*d*) are old iron pipes; (*d*1.) old railroad iron bent, as shown in Fig. VII., wedged in with iron keys; (*c*) old boiler plate, or anything else at hand not liable to burn. Inside casing as before. The lightness of the material enables us to do this work more easily than with timber, and more securely, the pipes being used to prevent the timber near the coal from catching fire. We constructed dams in this manner, filling all inside with clay, which kept the fire off permanently in very loose and dangerous ground, where other dams could not be used on account of the running of the coal.

Figs. VIII and IX. show the method used to run below burning timber and coal; it is also used in dams which we are compelled to leave open for a time, (to remove coal left behind,) but which we may have to close up at a moment's notice. It being a tedious and laborious work to cut in for a dam sufficiently into sides and top, no time would be allowed in such cases to do the work properly. For precaution, therefore, where it was anticipated that the ground must at some time be suddenly abandoned, this construction was used with very satisfactory results. The small doorway is easily closed, even if the fire is close at hand.

Fig. IX. is used where side pressure exists. It answers better than rock-arching in old works, and particularly when the ground is already on fire. It is then impossible to make a lasting job of an arch. The frames are bolted together. Great care must of course be taken to place dams in as solid ground as can be made available, and in all instances to cut in for the dams far enough at the sides, and particularly at the top, to prevent the fire from flanking the dams before it is smothered. This, in loose ground, is very troublesome, and requires often regular drifting in the sides and working overhead. Casing in front of such dams will help materially.

We have used the same system of casing in shafts with equal advantage, packing clay behind the curbing.

In damming off sections simultaneously which communicate with each other, an iron pipe must be inserted in each dam, to allow circulation of air to the last. These pipes are then closed simultaneously at a given time or signal

Figs. X. and XI. illustrate the robbing of the pillars when working homehomewards. Fig. X., "cross-cutting," was used in partially old ground, cross-cutting to the gob, and also in the thickest part of the seam. Levels midway between the main section levels were used to aid. The top behind was supported by filling in and by "cogs," or cob-work, (we have fortunately plenty of timber for our use).

Fig. XI. was used in more solid ground, and where the seams were thinner. The top seam worked independently, keeping top-seam-slate as temporary support. Strong rows of props in connection with cogs protected the lower ground of the workings. It was necessary here to work downwards, to keep open the lines of transportation.

Care must be taken not to open out too much ground at once, on account of the difficulty and cost of supporting the ground.

The arrows marked 1st, 2d and 3d in the ground plan indicate the changes of air-course we were compelled to make from time to time on account of fire.

The Roman figures in the ground plan of the pits indicate the series of main dams used to cut off the exhausted ground. Similar figures denote places cut off simultaneously. The main dams themselves and a great number of minor dams are left out, in order not to crowd the drawing.

Good judgment will be required in all instances. Use should be made in executing such work of material of as little value as possible, it being in almost all instances lost forever.

All my remarks being based on actual experience, I can warrant the practicability of the details here described. A close account of expenditures must be kept constantly, since the question of the abandonment or prosecution of work in each section of dangerous or already burning ground, must be decided from the financial as well as the engineering standpoint.

Venezuelan Gold Mines.

A REPORT UPON THE GOLD MINES LOCATED IN THE DEPARTMENT OF YURUARI, STATE OF GUAYANA, REPUBLIC OF VENEZUELA.

The Gold Mines located in the department of Yuruari, and commonly known as the Caratal Mines, are situated in the midst of a dense forest, some one hundred and forty miles distant in a southeasterly direction from Port Las Tablas, on the Orinoco River, and about 240 miles from its mouth. There is, for a new country, a fairly good wagon road leading from Port Las Tablas to the mines, passing for the most part through savannahs, but also at times winding through dense forests. A comparatively small proportion of the road is hilly and the mines are located at an altitude of only about 700 feet above the level of the sea, the highest point between Las Tablas and the mines on the wagon road being only 1,100 feet.

The mines themselves have not yet been developed to any very great extent, but they seem to be true fissure veins of white quartz carrying native gold, and run in a general northeasterly and southwesterly direction through a very hard metamorphic country rock, which has been christened, by some geologists, "Felstone," but is commonly known in the country as "Piedra Azul"—blue stone. Formerly the natives worked these ores without the assistance of machinery, breaking the quartz from the veins as they best could, and pulverizing and amalgamating it in mortars made of iron or stone, or even sometimes in cavities scooped out in the stumps of trees. Thousands of tons of quartz were worked in this way by the natives, as is proved by the "botadero" or residue left at the surface of the veins, and some idea of the richness of the quartz reduced may be formed from the fact that nearly all of this "botadero" yields in stamp mills from ten dollars to fifty dollars per ton. The veins that have been discovered and worked, up to the present time, occur in a belt having the same general direction as the veins themselves, viz.: northeast and southwest, the most distant points of working upon this belt being some four and one-half miles from each other.

At the present time there are eight mining companies in active operation in the Department of Yuruari, viz.:—The Orinoco Exploring and Mining Company; Compañia Minera del Callao; South American Mining Company; Hansa Gesellschaft; Potosi Mining Company; Mocupia and New York Mining Company; New York and South American Gold Mining Company; Caratal Mining Company. All these, with the exception of the "Callao," are composed of foreigners.

The Orinoco Company have a twenty-five stamp mill in which they reduce upwards of thirty tons of rock per twenty-four hours. This Company own an immense amount of mineral land, but at the present time they are stocking their mill entirely with ore from the Corina vein—a vein that has been opened at different points over an extent of 3,000 feet longitudinally, and has an average width of pay rock of five feet. Although this vein has been worked for some four years, the greatest depth yet reached is eighty-five feet.

The "Callao Company" have a fifteen stamp mill, which they stock for the most part with "botadero," although they own a vein that has an average width of two feet of solid quartz, and perhaps nearly three feet, all told, of pay rock. The small yield of this vein can only be attributed to bad management on the part of the Company. Last May was the only month, they told me, that they ever stocked their mill entirely with ore from the mine, and then they made $40,000 worth of gold.

The South American Company are at present erecting a thirty stamp mill to reduce ore from the Panama vein. The outcrop from this vein contains thousands of tons of gold-bearing quartz. Stamp-mill tests of this material have shown an average yield of upwards of thirty dollars per ton.

The "Hansa Company" have a twenty stamp mill, and are crushing quartz from the "Frailes" vein.

The "Potosi Company" have a twenty stamp mill, and are running partly ore from the Potosi vein, and partly botadero from the Chili vein. This Company have just erected a wire tramway to the mill from the Potosi mine, which is one and three-quarter miles distant.

The "Mocupia and New York Company" have, for some time, been running Chili botadero in a twelve-stamp Howland mill; but, at the same time, they have been opening the Chili vein, so that they can get ore enough to supply their stamps. In addition to the Howland mill they have ten other stamps, which they use when they have water.

The "New York and South American Gold Mining Company" are erecting a twenty stamp mill to run ore from the "Dalla Costa," the "Valparaiso," and the Callao veins.

The "Caratal Company" have been reducing, in a twelve-stamp Howland mill, quartz from the Caratal vein, and now they have just completed the erection of a ten-stamp mill, in which they intend to run on from the same vein.

The above mentioned are all the stamps that there are in the country, with the exception of a five-stamp battery that belongs to private individuals and is not in operation at the present time. The pay-seam in the above mentioned veins is very irregular in width, varying from two or three inches to eight or ten feet, but four feet would probably not be far from the average width of the pay material. Between the quartz and one of the walls of the veins there is generally a seam of soft material called "cascao," which corresponds to the "flucan" or "gouge" of some other countries. The presence of "cascao" greatly facilitates the working of the lodes. Another noticeable feature is the occurrence of great numbers of little seams permeating the quartz-mass in all directions, which renders it possible to work out large quantities of quartz in blocks without blasting.

Although the ore varies in richness in different parts of the same vein, yet the mill returns from month to month are remarkably even. It is very difficult to get accurate statistics from the companies, but the average yield of quartz reduced up to the present time will probably not be far from thirty dollars per ton. In some of the veins much of the gold is coarse and visible to the naked eye, while in others it is very fine and distributed in invisible particles through the quartz. As all the gold is readily taken up by quicksilver, the ore is admirably adapted to the ordinary stamp-mill process, the only loss being mechanical—that is, through the escape of fine gold that has not come in contact with the quicksilver or through the cutting off and washing away of gold already amalgamated. Up to the present time no pans have been used, nor has any attempt been made to save the gold except in the batteries and on the tables. The Potosi Company alone use blankets, making one ton of blanket-tailings from twenty-five tons of rock crushed. The superintendent of this company says that he finds no free gold in these tailings, but that he does find amalgamated gold to the amount of sixty dollars per ton.

The laborers at the mines are natives, half-breeds, and negroes, and are by no means first-class workmen. As an example parties abundantly capable of judging state that one average carpenter in England or the United States, using the wood of those countries, will do as much work in a given time as five Venezuelan carpenters working the South American wood.

The forests surrounding the mines furnish endless quantities of wood for fuel

and building purposes, the only difficulty in that direction being its extreme hardness. The quartz-veins at a comparatively short distance from the surface furnish water enough for milling purposes. The Yuruari river also flows through the district. The land where the forest has been cleared away is fertile, producing grass, Indian corn, and in fact, everything suited to this latitude—7° N. At the present time all the freight is transported from the Orinoco river, either by pack-mules or donkeys, or on carts drawn by oxen. The population at the mines, at present, is about 3,500. The Caratal mining region certainly cannot now be called healthy, as fever is very prevalent; it, however, very rarely proves fatal and seems to be decreasing as the forest is cleared away. The temperature averages about 83° Fahrenheit in the day-time and falls a few degrees at night.

The cost of transportation from Las Tablas to the mines varies at different seasons of the year and depends upon the nature of the article transported. General supplies cost from six to eight centavos per pound (a centavo=eight-tenths of a United States cent.)

Machinery costs:

For pieces weighing from	100 lb.	to	200 lb. ..	7 centavos,	per lb.
"	200 "	"	500 " ..	8 "	"
"	500 "	"	1000 " ..	10 "	"
"	1000 "	"	1500 " ..	11 "	"
"	1500 "	"	2000 " ..	12 "	"
	over 2000 "		..	17 "	"

Wages:

Coolies, per day, 9 hours	16 bits (1 bit=10 cents.)
Natives, " "	17 to 20 bits.
Miners, " "	20 to 21 "
Carpenters " "	28 to 32 "
Timber-hewers " "	24 "
Masons, " "	32 "

Board, per day:

Natives	8 to 10 bits.
Others	10 to 12 bits.

Prices of:

Riding mules	$100 to $300
Oxen, per yoke	125 to 150
Carts	200, capacity 1 ton.

Average price of wood delivered at mills $4 00 per cord.
Average price for cutting ..... 1 75 " "
Average land gives 100 cords per acre.
Cost of clearing land, per acre, $240.
Cost of building roads, per mile, $500 to $2,500.

Cost of mining, per ton	$1 to $5
Cost of milling, " "	3 to 5
Cost of incidentals " "	5 to 10

With sufficient capital and good management the ores of this country could, without doubt, be mined and reduced at a total cost of $10 per ton.

Of course there are obstacles to be overcome here as well as in other mining countries, but in my opinion this is destined to become a very important mining district, and a pretty sure indication of this is the fact that none of the companies now carrying on operations talk of abandoning them, but on the contrary, in most instances they intend to increase the capacity of their mills.

PORT-OF-SPAIN, Trinidad, W. I., August 7th, 1873. G. L. BRADLEY.

The Origin of Diamonds.

DR. A. C. HAMLIN, of Bangor, exhibited, at the meeting of the American Association for the Advancement of Science, a magnificent collection of gems, consisting of a great variety of colored diamonds, both cut and in the natural state; also, crystals of sapphire from Ceylon, together with many other gems of rare beauty. Dr. HAMLIN expressed the opinion that the diamond is, geologically, the newest of gems. He combated the theory that the diamond takes its crystalline form within solid rocks, by the disintegration of which it is released, and is subsequently found among the debris in river gravels and other similar places. He argues, rather, that the diamond is found in, or rather upon, beds of gravel, usually modified *drift*, and has never been found anywhere else, because it is formed alone among the gravel. The diamond placers of South America, of India, of Ceylon, and of South Africa are all geologically similar. The placer is usually a filled-up lagoon, of basin shape, with a gravelly bottom. Near the margin the diamonds are found at a slight depth, imbedded among the gravel. Further toward the middle of the lagoon the depth to the gravelly bottom may be seventy or eighty feet, hence it is necessary to dig to that depth to find the diamond stratum. This universal mode of occurrence leads to the conclusion—for which also other reasons were given—that the formation of diamonds began long after the close of the drift period, and that they are of undoubted vegetable origin, and have been crystallized by the crystallogenic forces pervading the gravel-beds, where they are now always found *in situ*. It has been observed that among the oldest collection of gems in India the diamond is of comparatively rare occurrence; from which, at least, a hint of a still more recent origin may be derived.

British Commercial Honesty.

THE *Chemical News* tells a story that does not reflect much credit upon the commercial honesty of English merchants. The Deputy Master of the Mint, in his annual report said, that "when the reports of the Assayer of the Mint, by whom gold ingots imported for coinage are assayed, do not agree with those of the trade-assayers by which the ingots are accompanied, the former almost invariably indicate the presence of less gold than the latter." Upon this the *News* lets out the following: "It is a fact but too well known to the initiated that large operators in bullion generally press the assayer to give high returns. If he, feeling certain that he is right, declines to 'cook' his results, they withdraw from him their patronage. Thus a class of 'high' assayers have sprung up, whose reports very naturally do not agree with those of the Assayers of the Mint."

Burning Coal Beds.

THE so-called "burning mountain" at Dudweiler, in the district of Saarbrück, which has been an object of interest to tourists and men of science for more than a century, is now shorn of its attractions; to the former it presents the spectacle of what is, at best, but a smoking mountain; to the latter it is a mere imposter, since, instead of being, as was supposed by earlier scientific observers, a display of volcanic action, or a proof of central fires, it is now clearly established as the result of the spontaneous combustion of a stratum of coal. These smouldering fires, produced by some change which takes place in the constituents of the coal may, indeed, burn with more or less intensity for centuries. The thought of such waste is peculiarly distressing at the present time, and the burning mountain of Dudweiler shows only common good feeling by mitigating its destructive proceedings at this crisis. A coal bed at Niederplanitz, near Zwickau, in Saxony, has been burning in a similar manner between 300 and 400 years. The heat given out by this subterranean fire, at a cost which it is distressing to calculate, is not wholly wasted. An ingenious person, since dead, has established a magnificent nursery-ground on the burning area, in which, by means of a system of pipes, the supply of caloric is regulated and applied at will. Tropical plants, especially pine-apples, flourish here in the open air with a vigor and luxuriance which the best forcing-houses and conservatories cannot insure.

Ore-Dressing Machinery.*

The Mechanical Appliances used for Dressing Tin and Copper Ores in Cornwall.

By Mr. HENRY T. FERGUSON.

FOR a long period the processes of dressing tin and copper ores remained stationary, the mechanical appliances being of a crude and simple character. Of late years, however, many improvements have been introduced in ore-dressing machinery. In mining, the ores are raised to surface in "kibbles" or skips, tipped into wagons and run to the dressing floors, where the large stones are broken up by hand in some mines, and in others by BLAKE'S stone crushers. After proper reduction they are sorted, where tin and copper occur in the same lode, those containing tin being placed in one heap, and those containing copper in another. The heaps or doles are then sampled, and the percentage of ore ascertained, the miners being paid in proportion to the value found. Large proportions of foreign matter being combined with the ore, the object of dressing is to separate the former from the latter, and the whole principle of dressing is mainly a separation of the particles by taking advantage of the differences in their specific gravities. The following table shows the chief constituents of tin ores and their specific gravities.

Sulphur	2.03
Quartz	3.00
Copper pyrites	4.25
Iron pyrites or mundic	4.90
Arsenic	5.00
Cobalt	5.00
Peroxide of tin	6.50 to 6.90
Wolfram (or tungstate of iron and manganese)	7.00 to 7.50

After the ore is sorted it is stamped to fine powder, the stamps consisting of cast-iron heads attached to wrought iron bars having arms keyed on to them, into which the cams of a revolving shaft engage. The lift is about 10 in. and each stamp makes from 50 to 65 blows per minute, the quantity stamped being from 15 to 20 cwt. in 24 hours. As the ore is reduced to powder it is carried away by a stream of water which flows constantly through the stamp coffers. In consequence of the slow action of the stamps a quantity of slime is produced, which retards the outflow from the stamps, and the ore is in part reduced unnecessarily fine. The remedy for this is HUSBAND'S pneumatic stamps, in which the rapidity of the blows is greatly increased by the use of an air spring. The stamp head is attached to a piston working in an air cylinder, to which a reciprocating motion is imparted by a crankshaft. When the cylinder is raised the air below the piston is compressed, and the stamp is thrown up, and on the crank turning the center, the air is compressed above the piston, and the stamp is driven down. The fall is 16 in., and 160 blows per minute are delivered, each head crushing from 9 to 11 tons per day. The powder leaves the stamps mixed with a large proportion of foreign matter, and is run into troughs, where it is deposited according to the specific gravity of the material composing it. The next process is that of "buddling," the buddle being a circular pit about 23ft. in diameter, and having a raised center. The ore, mixed with water, is fed in at the center, and flows evenly over the buddle, the bulk of the ore being deposited near the center, and the impurities towards the outer edge. When the pit is full the contents are removed according to their order of deposition, and are put through other buddles, washed, and rewashed, until nothing but the marketable ore remains. There are several varieties of buddles, some being con-

* Abstract of a paper read before the Institution of Mechanical Engineers at Penzance.

cave and some convex. The most recent improvement, however, is the knife propeller, which consists of a cylindrical frame rotating on a horizontal axis, and carrying a series of scrapers around its circumference, which revolve in a cylindrical trough, but without touching it. The action of the scrapers, which are arranged spirally around the framing, causes the ore to travel gradually along the trough, a stream of water carrying away the lighter substances. The machine is found very useful and efficient.

After the ore has been thoroughly washed it is calcined to get rid of the volatile impurities, the apparatus now generally used being Oxland and Nocking's calciner, which is a slowly revolving inclined cylinder 30 feet long and three feet interior diameter. The ore, after calcination, is cooled, and again buddled and washed several times until fit for market. A great quantity of tin ore passes away with the slime, which is afterwards recovered from streams and rivers by children.

In the case of copper the broken ore is sorted, and that which is sufficiently good is reserved for market. The poorer sort is crushed between chilled cast-iron rolls, and afterwards screened in a revolving riddle. The larger portions are recrushed, and the smaller are taken to jigging machines for separation. The jigger consists of a sieve placed in a trough through which a constant stream of water flows; a peculiar jerking motion is given to the sieve, which accelerates the separation of the ore from the waste. An improved form of apparatus is known as Collom's jigger, in which a pair of pistons working in trunks, and having a vertical stroke of 1 inch., are alternately struck by a rapidly vibrating lever, and raised by spiral springs, the result being to give pulsation to the water under the sieves. The action of this machine is very complete in separating the ore by an entirely self-acting process, and this is effected with a very small proportion of waste.

Brazilian Gold Mining.

THE gold bearing districts of this country consist of granite and gneiss, overlaid by micaceous and talcose slates, interlaced by thick quartz rocks, and bands of specular and magnetic oxides of iron.

The auriferous bed which appears to influence the productive character of the lodes is called "Jacotinga," and varies in width from six to about thirty feet; it is composed of sandy iron glance, earthy magnetic iron, brownish quartz, talc and earthy manganese.

The general direction of the lodes is about east and west, and they maintain, whatever their mineral character, an exact parallelism with the chain of mountains in which they occur; their size and width is generally from two to eight feet; the richest layers seldom exceed six inches, and are often less than an inch. Quartz and quartzite slates form, in some cases, a great part of the deposit to about 120 fathoms from the surface, common magnetic, and white iron pyrites prevail at greater depths, and arsenical pyrites also abounds. Isolated masses of yellow copper ore (copper pyrites) occur at intervals, but they are neither large nor numerous.

The following table, taken from the reports of the St. John del Rey Gold Mining Company, will show the assay contents of the ore, and the actual amounts yielded by the stamp mills, in which the ore is worked.

DATE.		Assay per ton grains.	Actual yield. grains.
7 Months,	1855	431.020	217.321.
April	1856	318.645	193.821.
July	"	315.768	190.113.
February,	1857	318.756	182.754.
March,	"	315.564	172.740.
August,	1858	318.700	168.922.
December,	"	314.108	173.514.
April,	1859	314.440	169.641.
January,	1860	424.381	261.323.
February,	"	405.458	272 555.
March,	"	405.956	300.955.
August,	"	424.159	290.925.
Whole year,	"	433.565	292.976.

Although some of these discrepant results may have been effected by occasional modifications in the prices of reduction, they chiefly depend on the greater or lesser ease with which the gold is freed from the various ingredients of its matrix in different parts of the mine.

The following table contrasts assays of ore prepared for the stamps with the proceeds of its reduction.

Years.	Assays grains per ton.	Proceeds grains per ton.	Loss per cent.
1855	4 1.02	220.21	48.92
1856	326.50	194.76	40.35
1857	288.00	164.33	42.94
1858	210.78	172.40	44.53
1859	359 64	215.84	32.98
1860	433.56	293.08	32.41

Since monthly assays of ore prepared for the stamps were established in 1855, the loss of gold during reduction has been diminished from 48.92 to 32.41 per cent., or 16.51 per cent., a difference which now affords a profit from ores that formerly could only have been wrought at a loss. Meanwhile the mine was deepened from 116.6 to 142.8 fathoms.

The results of operations at the Morro Velho mine during the year 1861 were

Crude ore broken in mine. tons.	Rubbish rejected. tons.	Ore stamped. tons.	Grains per ton. of ore.	Quantity extracted lb. Troy.
96612·20	24033·60	71902·40	383.990	5,050.907

From 19th of March 1861 to 21st of March, 1862, 5,200.689 lb. Troy of gold were obtained, which realized £212,813

The expenses for the year ending May 31st 1862, were 116,044

£96,769

In American coin equalling $470,330.00.

Mining Review.

The Mode of Geyser Action.

DR. E. ANDREWS, of Chicago, objects to the theory of geyser action as proposed by TYNDALL and BUNSEN, as accounting only for brief eruptions of foam and spray, whereas the geysers of the Yellowstone Valley throw streams of clear water for half an hour at a time. Dr. ANDREWS supposes that the conditions of a geyser exist whenever the cooler waters of surrounding regions pass by subterranean channels deeply into the earth, and, approaching the volcanic geyser region, rise somewhat, so as to enter one of the heated caverns of the volcanic rocks near its upper part, leaving it again by an opening lower than the one at which they entered, and passing thence upward toward the surface. The action is as follows: The heat of the rocks in the cavern causes the water to boil; steam accumulates in the upper portion of the cavern, and exerts pressure on the water, but cannot itself escape, because of the inverted syphon form of the cave; nor can the steam escape at the outlet channel, since that orifice is below the surface of the water The steam pressure therefore constantly increases, forcing the water to rush from the outlet into the external air. Dr. ANDREWS has devised an apparatus to illustrate his views, reproducing geyser action perfectly.

The Temperatures of Coal Mines.

APROPOS of the article on "the temperatures which man can endure" published by us lately, the following thermometric measurements made in the shaft of the Arley mine, in England, are interesting:

Total Depth.	Degrees.	Total Depth.	Degrees.
558 yards	78	745 yards	89½
605 yards	80	761 yards	90½
630 yards	83	775 yards	91½
663 yards	85	783 yards	92
671 yards	86	800 yards	93
679 yards	87	806 yards	93½
734 yards	88½	815 yards	94

The holes used in taking the temperature were made in the solid 3 feet, and allowed to remain thirty minutes before observation.

Engineering and Mechanical Notes.

IN his annual report, Mr. CHANDLER ROBERTS, Assayer of the British Mint, says that the new process of spectroscopic assaying devised by Mr. J. N. LOCKYER, F.R.S., has been experimentally tested. Mr. ROBERTS is of opinion that the use of the spectroscope for quantitative analysis well deserves careful examination. He states that, whilst the existing method—the gold-parting assay—affords results which are trustworthy to the 1-10,000th part of the weight of the assay piece, in the examination of a series of gold-copper alloys by means of the spectroscope differences of composition more minute than the 1-10,000 part can be readily distinguished. By the spectroscopic method, too, the value of the assay piece can be determined in a few minutes, whilst an assay by the ordinary method can hardly be completed in less than two hours. Mr. ROBERTS does not describe the exact method of manipulation, which has not been finally decided upon.

English papers report that the market for diamonds continues in a very depressed state owing to the abundance of the supply, and, with the exception of stones of very large size, brilliants, and small rose diamonds of the very finest quality, the fall in value has been general, and in some descriptions, such as rose-cut diamonds of mediocre to middling quality, equal to from 30 to 40 per cent.

Some of the results obtained by the Danks puddler in England are quite unique in the metallurgy of Cleveland. A puddled bar made in the rotary furnace was rolled into an angle 75 feet long, the angle being three inches by three, by three-eighths. A rail made last week from the same iron was exposed to a most severe test, and passed the ordeal triumphantly. The rail was placed between uprights—the bearings being three feet three inches apart—and tested with a weight of 648 lb., giving it one blow of 10 feet, and four blows of 18 feet. On measuring the rail afterwards, it bent just nine inches, and did not show the least sign of fracture. The consumption of coal per ton of puddled ball has now been reduced to 15 cwt. at the Teesside works—that is, where molten metal is is put into the furnace; but if cold metal is used, it requires 20 cwt., or thereabouts. Comparisons made at the Teesside works, show that the Danks machine effects a saving as compared with the ordinary puddling process of 8 to 10 per cent. of the pig metal put into the furnace.

It is somewhat remarkable that in all Scotland there is now but one blast furnace under construction. That one is building for Messrs. COLIN DUNLOP & CO. There are 123 furnaces in blast against 132 last year.

Foreign papers say that the Ferrie system of self coking blast furnaces is about to be put to a practical trial in America, whither moulds for the various forms of firebricks required in its construction are about to be sent from a well-known fireclay firm in the Coatbridge district.

THE COAL TRADE.

NEW YORK, Sept. 4, 1873.

Anthracite.

We find but little change to report in the coal trade since our last weekly review. The new schedule of prices took effect on the 1st inst., and the demand for coal continues very active. The output at the mines is fully equal and in fact somewhat in excess of the corresponding period of last season, and if nothing unforeseen occurs we are sure in predicting a very heavy production of coal for the next few months.

There is considerable delay in loading vessels at the shipping ports, especially for the prepared sizes, which are mainly wanted for domestic purposes. Consumers are now returning from their summer vacations, and, having been enlightened by the able manner (?) in which the coal situation has been discussed by the "Metropolitan Press," have wisely concluded to lay in their winter supply at the current quotations, without waiting any longer for lower prices, so that we have to report the usual active demand, at retail, which is always looked for at this period of the year, and, in spite of the advice of those who know but little about the coal trade, we think consumers act wisely in not postponing their purchases.

Vessels are not plenty, and rates of freight show a disposition to advance. The supply of Cumberland is light, owing to the recent breaks in the Delaware and Chesapeake Canal. It is reported that strenuous efforts are being made by this company to have their canal in running order again by the 15th of September.

The agitation now taking place in England, relative to the encroachments of American producers of iron upon and into markets hitherto monopolized by British producers, is of interest to the coal trade. As it takes about two tons of coal to make a ton of pig metal, the increase of iron production in America is of vital import, and coal producers cannot but say "God speed the day when the natural advantages which the United States possesses in the exhaustless deposits of the raw material from which iron is produced, will enable her "to command the iron markets of the world."

Bituminous Coal.

A combination of circumstances has occurred to give a sudden impetus to the trade in this class of coals. A series of disastrous breaks in the Chesapeake and Ohio Canal, the last of which has been only just now repaired has cut off the large supplies shipped from Georgetown and Alexandria to this and the New England markets. Then, during the unprecedented storms of last month the destruction of a part of the Chesapeake and Delaware Canal, cut off the supplies from Baltimore, by that convenient route. These accidents occurred when the stocks of Cumberland coal in New York were low, and prices increased with the demand, from $7 25 at which they had ruled up to $7 50 and $8 00 per ton by the cargo. In this state of affairs the value of the connection made by the Consolidation Coal Co. with the Pennsylvannia R. R. has been demonstrated, as by that means supplies have been promptly got to New York, when, otherwise, until sailing vessels could get around from Baltimore, there would have been a famine for steamer coals. It is probable that the demand will continue active, and prices firm for the rest of the season, as large stocks have yet to be laid in for the winter supplies of the Transatlantic Steamers, which generally use the Cumberland Coal.

Bituminous Coal Trade, 1872 and 1873.

The following table exhibits the quantity of Bituminous Coal passing over the following routes of Transportation for the week ending August 30, 1873, compared with week ending August 31, 1872.

COMPANIES.	1872. Week.	1872. Year.	1873. Week.	1873. Year.
C. & O. Canal	17,169	420,928	12 651	391,008
B. & O. R. R.	22,544	831,357	33 970	963,411
Penn. S. Line	....	.....	3,818	55,963
H. & B. T. R. R.	7,352	200,282	9,660	294,289
*Harrisburg & D.	9,304	324 755	4,873	225,957
*L. V. R. R.	456	20,353	812	21 610
P. & N.Y.C. & R. Co.	7,526	256,800	5,801	216,502
Cumberl'd Branch Canal.	6,123	142.211	4,141	78,933
" Railroad	469	12,069	756	61,326
Total	70,943	2,206,485	76,482	2,818,999
	....		70,943	2,206,485
Decrease	....		....	
Increase	....		5,539	102,514

Pennsylvania Coal Company.

Shipments of Pittston Coal for the week ending August 30, 1873.

	1873. WEEK.	1873. YEAR.	1872. WEEK.	1872. YEAR.
By Railway	29 292 15	810,744 08	27,335 07	780,201 11
" Canal	252 10	5,187 01		3,593 15
	29 545 05	815,931 09	27,335 07	783,795 06
Increase, 1873	32,136 03			

Anthracite Coal Trade for 1872 and 1873.

The following table exhibits the quantity of Anthracite Coal passing over the following routes of transportation for the week ending, 1873, August 30, compared with the week ending August 31, 1872.

COMPANIES.	1872. WEEK.	1872. TOTAL.	1873. WEEK.	1873. TOTAL.
Phila & Reading R.R†	96,344	3,126,506	104,587	3,477,305
Schuylkill Canal	24,367	539 651	30,164	474 188
Lehigh Valley R. R.	57 480	2,563,244	77 831	2,385,939
Lehigh & Sus. R. R.	43,362	1,124,562	55,939	1,310,375
" " Canal	20,148	484,420	26,461	437,917
Scranton North	17, 87	472,815	31,521	601,629
" South	42,694	1,432,005	39,765	1,420,490
Penn. Coal Co., rail	27,335	780,202	29,291	810,744
" " " canal		3,594	252	5,187
Del. & Hud C.Co. Canal	50,268	906 918	46,353	906 638
" " East	9 049	377 742	13 193	273 080
" " West	8 108	256,843	15,339	347,245
" " South	9,932	260,133	2,046	134,177
Shamokin	14,983	365,362	21,544	413,137
Trevorton	..	....	....	....
Lykens Valley Coal Co.	....	....	....	....
Wyoming North	....	....	....	....
Wyoming South	....	....	....	....
P. N. Y. C. & R. R. Co.	12,047	432,688	18,424	506,483
Williamstown Col'y	....	.....	....	....
Big Lick Col	....	.....	....	....
Total	438,404	12,916,697	511,912	15,476,435
1872			438.404	12,816,697
Increase			73,508	659,738
Decrease				

These figures are for the week and fiscal period commencing Nov. 30

† Lern coal transported for Company's use and Bituminous coal.

Report of Coal Transported over the Lehigh Canal

For the week ending August 29, 1873.

REGIONS SHIPPED FROM	TIDE. tons. ct.	LOCAL. tons. ct.	TL. WEEK tons cwt.	TL. DATE tons, cwt.
Mauch Chunk Region	3,051 15	3.914 10	6,969 15	151,631 12
Mauch Chunk Region Hazardville	1 672 15	471 12	2,144 07	769 04
Beaver Meadow Region	795 00	4,989 12	5,784 12	77,591 15
Mahanoy Region		432 05	432 05	13,271 10
Hazleton Region	591 17	4,884 00	5,475 17	116,163 07
Upper Lehigh Region	293 08	772 17	1,066 25	17,438 18
Wyoming Region	2,296 14	1,425 11	3,722 05	1,8.2 05
Wyoming Region, Hazardville	861 07		836 07	59,219 18
Total,	9,570 16	16,790 07	26,461 03	437,917 09
Previously reported	149137 13	262318 13	411,456 06	
Total to date	158708 09	279109 00	437,917 09	
Corresponding week last year	185395 14	298824 12	484 420 06	
Increase.				
Decrease	26,887 05	19,615 12	46,502 17	

DISTRIBUTION.	WEEK 1873.	WEEK 1872.	YEAR. 1873.	YEAR 1872.
Consumed on line of Lehigh Canal	2,383 12	1,755 18	45,789 15	46,524 18
Passed into Morris Canal to Tidal Points	66 06	191 05	1,925 16	3,645 15
Passed into Morris Canal to Local Points	834 11	1,135 03	18,392 11	15,118 07
Passed into Del. & Rar. Canal to Tidal Points	9,504 10	8,695 08	156,882 13	181,949 19
Passed into Del & Rar. Canal to Local Points	157 17	569 00	7,619 09	9,816 03
Consumed on line Delaware Div. Canal	2,153 17	1,384 14	26,685 03	30,479 17
Passed through to Bristol	11,270 10	11,416 08	180,822 02	196,885 07
	26,461 03	25,147 16	437,917 09	484,420 06

Report of Coal Transported over Central R.R. of N. J. (Lehigh and Susq. Div.)

Week ending August 30—Compared with same time last year

REGION SHIPPED FROM.	TIDE. tons ct.	LOCAL. tons ct.	CANAL. tons ct.	TL WEEK tons cwt.	TL. DATE tons. cwt.
Wyoming	30115 14	9930 14	2448 04	42494 12	1169364 02
Upper Lehigh		34 9 13	1185 05	4575 18	131469 14
Beaver Meadow	6023 03	3117 04	5142 07	14282 14	197483 12
Hazleton		389 07	6492 04	6881 11	125103 19
Mauch Chunk	5078 16	4366 04	7361 15	16836 15	367671 16
Total	41217 13	22233 02	22600 16	85051 10	1991090 03
Prev'ly reported	908115 09	638184 10	356738 15	1902038 13	
Total to date	949333 01	660417 12	379339 10	1987090 03	
Same time 1872	794578 15	565203 08	314044 06	1673926 09	
Increase	154754 06	94114 04	65295 04	313163 14	
Decrease					

DISTRIBUTION.	WEEK 1873.	WEEK 1872.	YEAR 1873	YEAR 1872.
Forwarded East by Rail to Tidal points	41217 13	31766 15	949333 01	794578 15
Forwarded East by Rail to Local points	12824 10	9689 17	293986 14	272479 06
Forwarded East by Rail use Central Division	2025 19	1733 04	59211 09	51662 06
Forwarded East by Rail use L. & S.	171 05	174 10	7843 11	5832 03
Delivered at and above Mauch Chunk	2584 06	1539 07	52382 15	37172 06
Delivered at Coalport & Hazard for Canal	22500 15	22113 01	416426 13	352516 03
Delivered to L. V. R. R. at Packerton	471 06	355 10	16804 05	9950 17
Delivered to L. V. R. Rd. at Sugar Notch	693 18		66338 18	
Delivered to L. & B. R. R. at Plymouth Bridge	2761 19	5738 16	128762 17	149714 13
Total	85051 10	73109 00	1991090 03	1673926 09

Philadelphia & Reading Railroad and Branches.

COAL TONNAGE

For the Week ending Saturday, August 30, 1873.

BY RAILROAD.—ANTHRACITE.

PASSING OVER MAIN LINE AND LEB. VAL. BRANCH.

	Tons. Cwt.
From St. Clair	34,092 05
" Port Carbon	3,920 03
" Pottsville	2,161 12
" Schuylkill Haven	25,961 11
" Pine Grove	5,493 09
" Tamaqua	14,422 00
" Harrisburg	
" Dauphin	8 234 19
Total	104,286 19

FOR SHIPMENT BY CANAL.

Passing Frackville Scales	8,675 12
" Mill Creek "	1,199 05
" Schuylkill Valley Scales	1,394 18
" Mt. Carbon "	1,650 10
" Cressona "	12,101 04
" Pine Grove "	253 15
" Tamaqua "	2,925 04
Total	28,100 08

SHIPPED WESTWARD VIA CATAWISSA AND WILLIAMSPORT BRANCH AND NORTHERN CENTRAL RAILROAD.

Via Catawissa & Williamsport Br.	335 01
" N. C. R. R. passing Locust Gap	3,044 13
" " " Shamokin	6,145 16
" " " Herndon	....
Total	9,585 10

SHIPPED WEST OR SOUTH FROM PINE GROVE.

Via Schuylkill & Susquehanna R. R.	1,760 04
" Lebanon & Pine Grove Branch	1,401 03
Total	3,161 07

CONSUMED ON LATERALS.

From Frackville Scales	778 10
" Mill Creek "	316 03
" Schuylkill Valley Scales	961 02
" Mt. Carbon "	1,018 11
" Cressona "	563 00
" Pine Grove "	61 18
" Tamaqua "	836 03
Total	4,235 07

LEHIGH AND WYOMING COAL.

Received via Silverbrook Junction, Sent East	12,597 16
" Cat. & Wpt. Br., Sent West	....
" " Rupert, Cat. & Wpt Br.	....
" " Allentown R. Penn'a Br.	39 07
" " Alburtis, "	70 16
" " Oreland, G. & N. Br.	883 14
" " Willow Street R. R.	960 00
Total	14,551 13

BITUMINOUS.

From Harrisburg	4,872 16
" Connecting R. R., G. & N. Br.	
" Junction R. R.	....
Total	4,872 16

COAL FOR COMPANY'S USE.

Anthracite	7,201 10
Bituminous	248 19
Total	7,450 09

RECAPITULATION.

	Total for Week.	Corresp'g week last year.	Increase and Decrease.
Passing over Main Line and Leh. Val. Branch	104 286 19	96,344 07	i 7,942 12
For Shipment by Canal	28,100 08	23,686 11	i 4,413 17
Shipped Westward via Northern Central R. R.	9,5 5 10	7,011 10	i 2,574 00
Shipped West or South from Pine Grove	3,161 07	1,453 14	i 1,707 13
Consumed on Laterals	4,235 07	3,803 15	i 431 12
Lehigh and Wyoming Coal	14,551 13	1,561 08	i 12,990 05
Total Anthracite paying freig't	163,921 04	133,861 05	i 30,059 19
Bituminous	4,872 16	9,304 15	d 4,431 19
Total of all kinds paying freig't	168,794 00	143,166 03	i 25,628 00
Coal for Company's use	7,450 09	5,801 11	i 1,648 18
Total Tonnage for Week	176,244 09	148,967 14	i 27,276 18
Previously this year	4349333 12	4147961 07	i 201,372 05
Total to date	4525578 01	42969.8 18	i 228,649 03

SHIPPED BY CANAL.

From Schuylkill Haven	27,080 00	25,469 15	i 1,610 05
" Port Clinton	3,084 00	1,655 00	i 1,429 00
Total Tonnage per Week	30,164 00	27,124 15	i 3,039 05
Previously this year	444,023 15	518,633 05	d 74,609 10
Total to date	474,187 15	545,758 00	d 71,570 05

Delaware and Hudson Canal Company.

Coal mined and forwarded by the Delaware and Hudson Canal Company for the week ending Saturday, August 30, 1873.

	WEEK.	SEASON.
By Delaware and Hudson Canal	46,353	906,638
By Railroad, East	13,193	273 080
" West	15,339	347,245
" South	2,046	136,173
Total 1873	76,731	1,663,086
Corresponding time in 1872:		
By Delaware and Hudson Canal	50,268	906,918
By Railroad, East	9 049	277,742
" West	8,108	256,843
" South	9,932	250,133
Total	77,357	1,791,636
Decrease	128,550	

Penn. and N. Y. R. R.—Coxton, Pa.

Coal tonnage for week ending August 30, 1873.

	Week. Tons.	Cwt.	Total. Tons.	Cwt.
Anthracite received:				
From Lehigh Valley R. R.	13,646	10	339,.29	19
" Lack. & B. R. R.	1,195	18	25,834	00
" Pleasant Valley R. R.	2,785	15	115,559	08
" Sul. & Erie R. R.	795	11	25,359	13
Total	18,423	14	506,483	00
Same time last year	12,046	19	422,688	03
Increase	6,376	15	73,794	17
Decrease				
Distributed:				
To Lehigh Valley R. R.			23,568	01
To Lack. & B. R. R.	80	06	1,178	11
To S. Central R. R.	4,331	17	109,644	17
To Ithaca & A. R. R.	4,164	06	101,546	04
To Erie R. W. Pockets for shipm't.	6,952	17	184,800	12
To Erie R ilway, Wat'ins direct.	742	04	7,459	11
To individuals on line of road	808	08	20,496	16
To points at & above Coxton for use of Co	720	04	19,769	00
To points between Waverley and Elmira	623	06	38,019	08
Total	18,423	14	506,483	00
Bituminous received from BARCLAY R. R.				
Shipped north from Towanda	5,759	17	214,781	00
Shipped south from Towanda	41	17	1,617	13
Northern Central R. R.			103	04
Total	5,801	04	216,501	17
Same time last year	7,526	07	256,500	10
Increase				
Decrease	1,725	03	39,998	13
Distributed:				
To Erie Railway	5,681	02	194 646	07
To So. Central R. R.			19,719	10
To Ithaca Valley R. R.			351	06
Lehigh Valley R. R.	78	15	835	02
To individuals on line of Railroad.	41	17	831	08
To points on line of road for use of Company			118	04
Total	5,801	14	216,501	17
Grand totals transported				
Anthracite	18,423	14	506,483	00
Bituminous	5,801	14	216,501	17
Total	24,225	08	722,984	17
Same time last year	19,573	16	689,188	13
Increase	4,651	12	33,796	04
Decrease				

Statement of Coal Transported over Cumberland and Pennsylvania Railroad

During the week ending Saturday August 30, and during the year 1873, compared with the corresponding period of 1872.

WEEK.

	C. & O. C'l Tons.	Cwt	B. & O. R. R. Tons.	Cwt.	Pa. S. Line Tons.	Cwt	Total. Tons.	Cwt.
1873	12,651	02	33,969	19	3,818	06	50,439	07
1872	17,168	12	22,544	00	....		39,712	12
Increase	....		11,425	19	3,818	06	10,726	15
Decrease	4,517	00	.....		....			

YEAR.

1873	391,097	15	963,441	13	55,962	15	1,410,382	08
1872	423,928	02	831,357	05	....		1,252,285	07
Increase	....		134,564	13	55,962	15	157,097	01
Decrease	29,920	07	....		....		....	

Cumberland Branch R. R.

WEEK.

	To C. & O. Canal. Tons.	Cwt.	To B. & O. R. R. Co. Tons.	Cwt.	Total. Tons.	Cwt.
1873	4,141	04	756	14	4,897	18
1872	6,123	02	469	01	6,592	03
Increase			287	13		
Decrease	1,981	18	.....		1,694	05

YEAR.

1873	78,932	14	61,325	13	140,258	07
1872	142,211	00	12,065	17	154,279	17
Increase			49,256	16		
Decrease	63,278	06			14,021	10

Delaware Lackawanna & Western Rail Road Company.

Coal transported on the Delaware, Lackawanna, & Western Railroad for the week ending Saturday, August 30, 1873.

	WEEK. Tons.	Cwt.	YEAR. Tons.	Cwt.
Shipped North	31,021	02	601,629	11
Shipped South	39,265	02	1,420,490	04
	70,786	04		
Total			2,022,119	15
For the Corresponding time last Year:				
Shipped North	37,287	10	472,814	19
Shipped South	42,093	13	1,432,004	17
Total	59,981	03	1,904,819	16
Increase	10,805	01	117,299	19
Decrease				

Delaware and Hudson Canal Company.

Coal mined and forwarded by the Delaware and Hudson Canal Company for the week ending Saturday, August 30, 1873.

	WEEK.	SEASON
North	63,303 07	1,764,628 00
South	2,046 01	136,172 18
Total 1873	65,349 08	1,900,800 18
Corresponding time in 1872:		
North	56,853 15	1,713,209 18
South	9,932 07	250,132 18
Total, 1872	66,786 02	1,963 342 16
Increase North	6,449 12	51,418 02
Decrease North		
Increase South		
Decrease South	7,886 06	113,960 00
Increase		
Decrease	1,436 14	62,541 18

Report of Coal Transported over Lehigh Valley Railroad

Report of coal tonnage for the week ending August 30, 1873, with Totals to date, compared with same time last year.

WHERE SHIPPED FROM.	WEEK. Tons.	Cwt.	TOTAL Tons.	Cwt.
Total Wyoming	17,517	10	622,937	12
" Hazleton	56,842	02	1,568,977	15
" Upper Lehigh			2,202	00
" Beaver Meadow	15,090	10	477,951	13
" Mahanoy	13,077	01	353,320	13
" Mauch Chunk	172	19	2,928	07
Total	101,760	04	3,028,320	00
Same time last year	79,762	14	2,861,945	05
Increase	20,997	10	166,374	15
Decrease				
Forwarded East from Mauch Chunk by rail	77,831	03	2,355,930	08
Same time last year	57,480	07	2,263,244	00
Increase			92,086	08
Decrease	20,350	16		

DISTRIBUTED AS FOLLOWS.

Local East of Mauch Chunk	1,927	00	52,173	12
Forwarded East for use L. V. R.	913	02	38,878	09
Delivered to Furnaces and Manufacturing Companies	13,547	09	511,193	16
Delivered to Cat & Fog. R. R	110	14	4,671	03
" " East Penn R. R.	3	15	6,666	14
" " North Pennsylvania Railroad	7,085	08	233,969	18
" " Port Del	7,463	02	135,660	01
" " East' Amboy Railroad				
" " Morris and Essex Railroad	6,252	18	207,782	15
" " Bel. Del Railroad	30,182	18	750,878	00
" " Central Railroad	10,344	17	410,056	00
Delivered at and above Mauch Chunk for use of L. V. R. R.	1,549	15	50,030	14
To P. & N. Y. R. R.	13,646	10	3.9,729	19
To Northern Central R. R.			12,196	02
To D. H. & W. R. R.	487	12	24,891	00
To L. & S. R. R. at Packerton for rail	353	10	9,840	19
To Individuals at Mauch Chunk	38	06	1,899	14
To Individuals above Mauch Chunk	216	17	10,384	08
To L. & S. R. R., at Penn Hav., for railroad			1,541	10
Do. for canal	5,475	17	116,163	07
To Lehigh Canal Mauch Chunk	2,180	14	46,555	17
To Catawissa Railroad			50	00
To L. & B. R. R. at Lack. June			89,116	02
Total	101,760	04	3,028,320	00

Northern Central Railway, Shamokin Division.

Below is the return of Coal sent over the Shamokin Division of the N. C. R. W., for the 7 days ending August 30, 1873.

	Tons.	Cwt.		
East	1,804	16		
West	19,739	06		
			21,544	02
Same time last year			14,982	11
Increase			6,561	11
Decrease				
Total amount shipped to date			413,136	14
Same time last year			365,362	06
Increase			47,774	08
Decrease				

Prices of Coal by the Cargo.

[CORRECTED WEEKLY.

	AT NEW YORK R. A.	W. A	AT PHILADELPHIA. R. A.	W. A.
SCHUYLKILL.				
Lump	$— —	$ —	— —	4 50
Steamer	— —	—	— —	4 50
Broken	—	—	4 60	4 60
Egg	—	—	4 75	4 00
Stove	—	—	4 95	4 80
Chestnut	—	—	3 85	3 85
Pea	— —	— —	— —	— —
LEHIGH.				
Freight to New York 50 cents.			— —	— —
Lump, (on board)	— —	— —	— —	— —
Broken	— —	— —	— —	— —
Egg	— —	— —	— —	— —
Stove	— —	— —	— —	— —
Chestnut	— —	— —	— —	—
Pea	— —	— —		
SPECIAL COALS.				
Honey Brook, Le'h W. A.	5 80@5 05		— —	— —
Spring Mountain " "	5 80@5 10		— —	— —
Sugar Loaf " "	4 00@5 90		— —	— —
Room Run " "	5 05@5 75		— —	— —
Hill & Harris " "	—		— —	— —
Shamokin " "	4 10@4 70		— —	— —
Lykens Valley " "	4 70@6 05		— —	— —
Broad T " "	—		— —	— —

Company Coals.

Sept. 1873.

	L.	Bkr.	Bra.	Eg.	Sto.	Chest
*Scranton at E. Port	— —	— —	— —	— —	— —	— —
Pittston at Newburgh	4 90	4 90	5 05	5 10	5 40	4 90
*Lackawana at Rondout	5 15	5 25	5 35	5 40	5 70	5 10
Wilk'b're at Pt. John'n	4 95	5 05	5 15	5 30	5 50	4 95
Old Co. Lehigh at Pt. John'n	5 90	5 75	5 75	5 85	5 10	—
New York Coal Exchange	5 90	5 75	5 75	5 85	5 10	—

For freights to different points see "Freights"
*To contractors only.

Prices at Baltimore—Sept. 1873.

Wholesale Prices to Trade.

Wilkesbarre, by cargo or car load	$5 65@6 00
Pittston and Plymouth, do	5 40@5 75
Shamokin Red or White Ash, do	5 60@6 00
*Lykens Valley Red Ash, do	@6 30
By retail, all kinds per ton of 2,240 lbs	7 25@8 25
*George's Creek and Cumberland f. o. b. at Locust Point for cargoes	4 85@5 00
West Va. and Youghigheny gas f. o. b. at L. Point	6 50
Kanawha Cannel, coarse	@

*Freight to New York $2 15.

BITUMINOUS COALS.

Kittaning Coal Co.'s Phœnix Vein, f. o. b. at Phila	$
Lemon " " "	
Cumberland Vein Coal	
Tyconnel f. o. b.	$7 00

Prices at Georgetown, D.C., and Alexandria, Va.

Sept. 1873.

George's Creek and Cumberland f. o. b. for shipping $4 60@4 75

Prices at Havre de Grace, Md.

Sept. 1873.

Wilkesbarre and other White Ash for Cargoes	$5 25@5 50
Lykens Valley	5 50@5 75
Shamokin Red or White Ash	6 00@6 50

Bituminous Coals (Cumberland).

Georgetown, F. o. b.	$4 60
Baltimore "	5 00
New York "	7 50
South Amboy "	6 80

Prices of Foreign Coals.

Sept. 1873.

Duty 75 c. per ton.

Corrected weekly by ALFRED PARMELE, No. 32 Pine street, N. Y.

Liverpool Gas Caking	— —@— —
" " Cannel	17 00@— —
" House "	20 00@22 00
" Orrel	20 00@— —

Per ton 2,240 lbs., ex-ship.

PRICES FROM YARD.

Liverpool House Orrel, screened	$20 00@22 00
"Cannel, "	22 00@25 00

Per ton 2,000 lbs. delivered.

Prices of Gas Coals.

Sept. 1873.

PROVINCIAL.

Corrected weekly by Louis J. Beiloni, Jr., 41-43 Pine st., N. Y

	Coarse	Slack
Block House, f. o. b. at Cow Bay	$2 50	$1 25
Gowrie	2 00	0 00

Corrected by Bird, Perkins & Job, 27 South street.

	Coarse	Culm of Coal,
Pictou	nett $3 00	1 50
Sydney	3 25	1 00
Lingan	2 75	1 00
Caledonia	2 75	1 25

A discount from the prices of the coarse Coal on purchase of 5000 tons and upwards. Duty on all slack coal or Culm: 40c. per ton of 28 bushels, 80 pounds to the bushel. On all bituminous coal or shale: 75 cents per ton of 28 bushels.

AMERICAN.	Nominal quotations Currency.
Westmoreland f. o. b.	$9 00 @7 00
Fairmount Gas Coal Co. of N. Y.	6 50 @7 00
Despard Coal Co.	6 50 @7 00
Penn.	6 50 @7 00
Newburg Orrel Gas	6 50 @7 00
West Fairmount Gas Coal	6 50 @7 00
Redbank Cannel, at Pa.	12 00 @0 00
AT PHILADELPHIA.	
Westmoreland	7 50 @0 00

Freights.—Sept. 1873

TO EASTERN PORTS.	Cumberland. From Georgetown.	From Baltimore	Anthracite. From Philadelphia.	From Elk, Port Johnson, Weehawken, and Hoboken.	From Newburgh.	From Rondout.
Amesbury	—	—	—	—	—	—
Bangor	—	—	—	1 90	—	—
Bath	—	3 00	—	—	—	—
Boston	—	3 00	—	1 85*	2 25	2 05
Bridgeport	—	2 63	—	1 00	—	1 25
Bristol	—	—	—	1 30	—	1 45
Connasset Nar'ows	—	—	—	—	—	—
Derby	—	—	—	1 25†	—	—
Dighton	—	—	—	—	—	—
East Cambridge	—	—	—	—	2 25	—
Fall River	—	2 50	—	1 30	1 60	1 45
Hackensack	—	—	—	—	—	—
Hartford	—	3 25	—	1 50	—	1 70
Hoboken	—	—	—	50	—	65
Jersey City	—	—	—	50	—	65
Lynn	—	—	—	—	—	—
Middletown	—	—	—	1 25	—	1 45
Mystic	—	—	—	1 25	—	—
New Bedford	—	2 50	—	1 35	—	1 50
Newburyport	—	3 12	—	2 05	—	2 15
New Haven	—	2 50	—	1 00	1 20	1 25
New London	—	2 50	—	1 20	1 40	1 35
Newport	—	—	—	1 30	1 60	1 40
New York	—	2 15	—	56	—	65
Norwalk	—	2 60	—	1 00	—	1 25
Norwich	—	2 50	—	1 25	1 50	1 50
Pawtucket	—	2 75	—	1 40‡	—*	—
Portland	—	3 00	—	1 80	—	—
Portsmouth, N. H	—	3 12	—	2 00	—	—
Providence	—	2 50	—	1 30	1 60	1 45
Rockport	—	—	—	—	—	—
Saco	—	—	—	—	—	—
Sag Harbor	—	—	—	1 20	—	—
Salem	—	3 00	—	1 90	—	—
Stamford	—	—	—	1 00	1 20	2 05
Stonington	—	—	—	1 25	—	1 35
Taunton	—	—	—	1 70	—	—
Warren	—	—	—	1 30	—	—
TO RIVER PORTS						
Albany	—	2 75	—	—	—	55
Catskill	—	—	—	—	—	50
Cockackie	—	—	—	—	—	50
Coeyman's	—	—	—	—	—	65
Cold Spring	—	—	—	—	—	50
Fishkill	—	—	—	—	—	20
Haverstraw	—	—	—	—	—	40
Hudson	—	2 60	—	—	—	40
New York vessels	—	—	—	—	—	65
Nyack	—	—	—	—	—	45
Poughkeepsie	—	—	—	—	—	30
Rhinebeck	—	—	—	—	—	30
Rondout	—	—	—	—	—	—
Saugerties	—	—	—	—	—	40
Sing Sing	—	—	—	—	—	50
Stuyvesant	—	—	—	—	—	55
Tarrytown	—	—	—	—	—	50
Troy	—	2 75	—	—	—	60
West Point	—	—	—	—	—	20
Yonkers	—	—	—	—	—	50

† 3 c. per bridge per ton in addition to freight.
† New Haven rate and towing 25 c. extra per ton.
‡ Towing from Providence and return, extra.
‖ And Towing.

St. Thomas	$— — Gold
Martinique	— — "
Demerara	— — "
New Orleans	— — "
Mobile	— — "

Foreign and Provincial Freight

Sept, 1873.

Foreign.

Newcastle and Ports on Tyne, per keel of 21 1-5 tons £
Liverpool, 5 per cent primage

TO NEW YORK.

Provincial

Sydney	
Lingan	$ 5
Cow Bay	4 00
Port Caledonia	4 00
Little Glace Bay	4 00

TO BOSTON.

Sydney	4 00
Lingan	3 50
Cow Bay	3 50
Port Caledonia	3 50
Little Glace Bay	3 50

TO MONTREAL.

Caledonia .. .. 3 75 gold

TO CUBA.

Caledonia .. .. 9 50 gold.

Rates of Transportation to Tide Water.

BY RAILROAD.

TO PORT RICHMOND, PHILADELPHIA.

Philadelphia and Reading Railroad, from Schuylkill Haven Lump and St., net, $1 60; Br., Egg and Ch., $1 65; Stove, $1 75 Shipping at Pt. R., 20c., for use at Phil., $2 18 from Pt. Carbon.

MAUCH CHUNK TO ELIZABETHPORT.

L. V. Railroad from Mauch Chunk to Phillipsburgh	$0 72
C. R. R., N. J., Phillipsburgh to Elizabethport	66
Shipping expenses at Elizabethport	25
Wharfage	10
Total	$2 23

MAUCH CHUNK TO PORT JOHNSTON.

L. V. R.R., or L. & S. R.P. from M. C. to Phillipsb'g	$0 72
C. R. R., of N. J., Phillipsburgh to Pt. Johnson	1 06
Shipping expenses	25
Wharfage	10
Total	$2 23

TO HOBOKEN

L. V. R. R., Mauch Chunk to Phillipsburgh	72
Morris & Essex R. R. Phillipsburgh to Hoboken,	6
Shipping expenses	25
Wharfage	00
Total	$2 23

TO SOUTH AMBOY.

L. V. R. R.	
B. & D. R. R.	$1
Cam. & Am. R. R.	
Shipping Expenses	35
Total	$2 23

PENN HAVEN TO ELIZABETHPORT.

L. V. & R. Penn Haven to Phillipsburgh	84
C. RR. of N. J. Phillipsburgh to Elizabethport	1 06
Shipping expenses	15
Wharfage	20
Total	$2 35

MARKET REVIEW.

NEW YORK, Sept. 4, 1873.

IRON—Scotch Pig moves slowly, the demand being still light; the recent advances abroad have had the tendency to make holders rather firmer, but, in the absence of any special demand, prices are without material change; we quote Eglinton $43@$44, Glengarnock $44@$45, Gartsherrie $47.75@$48, and Coltness $50@$51; we have no sales to report. American Pig is steady at about our quotations: for No. 2 X Lehigh brands $40 is asked, but outside brands can be had as low as $36@$38; sales about 1500 tons at $42@$45 for No. 1, $36@$40 for No. 2, and $33 for Gray Forge. New Rails are without further business; we quote English $65@$68 gold, and American $75@$77 currency, at the works in Pennsylvania. The stock of old English is not large, and holders are not inclined to mention prices; we quote D. H. nominally $47, and T. $46. Scrap is quiet, most dealers asking an advance of $43@$45 for No. 1 Wrought. Messrs. WETMORE & Co., agents for Burdens, Troy, under date of 1st inst., quote "H. B. & S." ordinary sizes Bar, Round and Square and Flats, $97.50—extra sizes, Round, and Square, $102.50@$127.50; Flats, $102.50@$117.50; Ovals, $115@$130; Half Ovals, ½ & 9-16 to ⅝ and over, $120@$135; and Half Rounds, same sizes, $115@$130, net cash, being a reduction of $12.50 per ton from the quotations of December 2, 1872, and $25 reduction from the prices of a year ago. "Burden's" Best is the same as quoted December 2 last.

LEAD—Pig continues in demand, with further sales of 4@500 tons Foreign, closing at 6¾@7 cents asked; and Domestic, in lots, 6½ gold. Bar 9¼ cents, Sheet and Pipe 10½ and Tin-lined 16½, usual discount to the Trade.

Withdrawals from bond for consumption 28th, 29th and 30th August—

Lead, Spain .....pigs. 1,595
Lead, Germany..... 929

COPPER—Manufactured is steady at our quoted prices. Ingot is only in moderate demand; prices are unchanged; we note sales of 150,000 lb. Lake at 26¾ cents, prompt cash; and 100,000 lb. do., in lots, 27.

STEEL—Is strong at old figures, the demand being rather greater than the supply, especially for English Cast.

REGULUS ANTIMONY—Continues quiet at 13½ cents gold.

SPELTER—Remains very quiet, with prices nominally as before.

Withdrawals from bond for consumption 28th, 29th and 30th August—

Spelter, Germany.....plates. 450

TIN—Pig remains very quiet, but prices are supported, and for English there is a better feeling; 100 slabs Straits sold at 31¾ cents, generally held at 31½; and five tons English 28½, prompt cash, gold. Plates have been more active, but prices rather favor buyers, the weakness being most observable on Charcoal Tin; sales have been made of 1000 bxs. good brands Assorted Charcoal Tin at $10.75@$10.87½; 1750 do. prime brands, $11; 35 do. Coke Tin "Cynon," $8.50; 500 do. Y. Coke, 14 by 20, $8.50; 500 do. Coke Tin, 14 by 20, $8.75; 500 do. B. C. Coke Terne, $8; 250 do. A. G. Coke Terne, $8.12½ 75 do. Charcoal Terne, 20 by 20, $21.25, all gold; 1000 do. Coke Tin, 14 by 20, on private terms.

ZINC—Mosselmann Sheet is without change—100 casks sold from agents hands for forward delivery. By auction, 10 casks damaged Silesian Sheet sold at 8½@9¼ cents, cash. Manganese oxide 4½@5

METALS.

NEW YORK, Sept. 4, 1873.

IRON.—Duty: Bars, 1 to 1¼ cents ℔ lb; Railroad, 70 cents ℔ 1c lbs.; Boiler and Plate, 1¼ cents ℔ lb; Sheet, Band, Hoop, and Scroll, 1¼ to 1¾ cents ℔ lb; Pig, $7 ℔ ton; Polished Sheet, 3 cts. ℔ lb; Galvanized 2¾; Scrap Cast, $6; Scrap Wrought, $8 per ton. All less 10 per cent. No Bar Iron to pay a less duty than 35 per cent. ad val.

	Store Prices.
Pig, Scotch—Coltness ℔ ton	50 00@51 00
Gartsherrie	47 75@48 00
Glengarnock	44 00@45 00
Eglinton	43 00@44 00
Pig, American, No. 1	42 00@45 00
Pig, American, No. 2	36 00@40 00
Pig, American, Forge	33 00@— —
Bar Refined, English and American	— —@— —
Bar Swedes, assorted sizes (gold	— —@137 50

	Store Prices, Cash.
Bar, Swedes, 1⅜ to 5 x ⅜ & ⅞ 2 sq. & 6 to 12 x ⅜ & ½	175 00@— —
Bar, Refined, ⅜ to 2 in. rd. & sq. 1 to 6 in. x ⅜ to 1 in.	82 50@85 00
Bar, Refined, 1¼ to 6 by ¼	87 50@— —
Bar, Refined, 2⅛ to 2⅞ round 1 & 1⅜ by ⅛ & 5:16	90 00@— —
Large Rounds	92 50@107 50
Scroll	102 50@135 00
Ovals and half-round	110 00@130 00
Band	110 00@130 50
Horse Shoe	117 50@— —
Rods, ⅜ to 2-16 inch	92 50@135 00
Hoop	— —@160 00
Nailrod	— @ 9
Sheet, Russia, as to assortment (gold)	17 @ 18
Sheet, Singles, D. and T. Common	—5¾@— 7
Sheet, D. and T. Charcoal	—7 @— 8¼
Sheet, Galv'd, list 10 per cent. discount	— —@— —
Rails, English (gold), ℔ ton	65 00@ 68 00
Rails, American, at Works in Pennsylvania, currency	75 50@ 77 00

COPPER.—Duty: Pig, Bar, and Ingot, 5; old Copper 4 cents ℔ lb; Manufactured, 45 per cent. ad val.

	All Cash.
Copper, New Sheathing, ℔ lb	— @— 38
Copper Bolts	— @— 40
Copper Braziers, 16oz. and over	— @— 40
Copper Nails	— @— 45
Copper, Old Sheathing, &c. mixed lots	26 @— 27
Copper, Old, for chemical purposes, 14@16 oz	— @— —
Copper, American Ingot	27 @— —
Copper English Pig	— @— —
Yellow Metal, New Sheathing & Bronze	— @— 27
Yellow Metal Bolts	— @— 32
Yellow Metal Nails, Sheathing and Slat'g	27 @— 30

LEAD.—Duty: Pig, $2 ℔ 100 lbs.; old Lead, 1½ cents ℔ lb Pipe and Sheet, 2¾ cents ℔ lb.

Spanish (gold)	6 87½@7 00
German, do.	6 87½@7 00
English do.	6 87½@7 00
Foreign, Refined	7 25 @— —
Domestic do.	6 87½@7 00
Bar (net)	9 25 @ —
Pipe (net)	— —@10 50
Sheet	— —@10 50

STEEL.—Duty: Bars and ingots, valued at 7 cents ℔ lb or under 2¼ cents; over 7 cents and not above 11, 3 cents ℔ lb; over 11 cents, 3½ cents ℔ lb, and 10 ℔ cent ad val. Store prices.

English Cast (2d and 1st quality) ℔ lb			— 18½@— 23
English Spring (2d and 1st quality)			— 9½@— 10½
English Blister (2d and 1st quality)			— 14 @— 18½
English Machinery			— 14½@— —
English German (2d an 1st quality)			— 12½@— 14½
American Blister "Black Diamond"			— — @— 11½
American, Cast, Tool	do.		— — @— 17
American, Spring,	do.		— — @— 11
American Machinery	do.		— 11½@— 12
American German,	do		— 9 @— —

TIN.—Duty: Pig, Bars, and Blocks, 15 ℔ cent. ad val.; Plate and Sheets and Terne Plates, 25 ℔ cent.; Roofing 25. ad val.

	Gold ℔ lb.
Banca	34½@35
Straits	31⅝@31½
English	28 @28¼

PLATES.

Fair to Good Brands.	Gold.	Currency
I. C. Charcoal, ℔ box	$10 75 @11 00	$12 62½@13 25
I. C Coke	8 50 @ 9 00	10 00 @10 75
Coke Terne	7 50 @ 8 50	9 00 @10 25
Charcoal Terne	9 75 @10 25	11 50 @12 00

SPELTER—Duty: In Pigs, Bars & Plates, $1.50 p. 100 lb

Plates, Foreign (gold) p. 100 lb.	7 25 @—7 50
Plates, Domestic p lb.	8¾@—11

ZINC—Duty: Pig or Block, $1.50 per 100 lb.; Sheet 2½c per lb

Sheet per lb.	—10¼@10¾

San Francisco Stock Market.

BY TELEGRAPH.

NEW YORK, Sept. 4, 1873.

The following reports from the San Francisco Stock Board are dated August 28th and September 2nd. Excepting a slight decline in Raymond & Ely and Meadow Valley, the list has materially advanced. The telegram quotes Yellow Jacket as $12 higher than per the previous report, a remarkable advance if true, considering the light fluctuations which have recently characterized the movements of this stock.

	Aug. 28.		Sep. 2.
Savage	36½	—	46
Crown Point	86	—	96
Yellow Jacket	46	—	57
Kentuck, "New Issue"	7½	—	8½
Chollar Potosi	26	—	29½
Gould & Curry "New Issue"	10	—	13
Belcher "New Issue"	68	—	72
Imperial	4½	—	4¾
Raymond & Ely	74	—	65
Meadow Valley	17	—	16
Eureka G. V.	—	—	—
Ophir	—	—	—
Hale and Norcross	—	—	—

American Institute of Mining Engineers.

OFFICIAL BULLETIN.

Announcements to Members and Associates.

I. The ENGINEERING AND MINING JOURNAL, which is the Organ of the Institute, and contains its proceedings, transactions and notices of meetings, will be sent to each Member and Associate on the payment of his annual dues. Back numbers cannot, as a rule, be sent.

II. Dues are payable in advance at the annual (May) meeting. Remittances should be made, as far as possible, by P. O. Order, payable to the Secretary.

III. The first volume of Transactions of the Institute is in course of preparation and will be sent, as soon as issued, to all members not in arrears.

IV. General meetings are held on the fourth Tuesday of February, May and October. Authors of papers are requested to notify the Secretary, in advance of meetings, of the subject and length of their papers.

THOMAS M. DROWN, Secretary.

1123 Girard street, Philadelphia, Pa.

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ROSSITER W. RAYMOND, Ph. D.
JOHN A. CHURCH, E. M. Editors.

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THE SCIENTIFIC PUBLISHING COMPANY.

WILLIAM VENTZ, SECRETARY.

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SOME of the daily papers have been very learned on the needs of the American Association for the Advancement of Science, and have exhibited the kindest willingness to give advice to the scientific men of the country. A spirit like this cannot be too much encouraged, but it is necessary to point out to these gentlemen, that the pursuit of the editorial profession does not necessarily develop the wisdom of Solomon in men of this generation. One tells us that the Association is too crowded, and therefore too popular. Another thinks that its meetings will never be a success until it confines its work and its membership strictly to scientific components. The truth is that these critics make the mistake of testing the work of the Society by the furore which it arouses, or fails to arouse, in its annual meeting. This, however, is by no means the real or the best work of the Society. Its real work is not in reading the papers but in preparing them. Its real success is not in the ephemeral pleasure of the sessions, but in the study and thought which the papers arouse in the minds of those who read or have heard them. The meetings are valuable because the publicity there given to a laborer's work, the chance of having his conclusions tested by the criticism of the chiefs in the scientific world, and other concomitant advantages, act as a stimulus upon scientific men. There is probably more work done in the country from year to year, as a consequence of the Society's meeting, and that is one of its prime objects. The dullest meeting may, therefore, have a success which the political papers never hear of. They judge from surface appearances and in scientific things they are almost continuously wrong. The Association has this year been the recipient of a gift, which shows, that in the important respect of having a good reputation among the people, it is not without success. MRS. ELIZABETH THOMPSON, of New York, a newly elected member, has given $1,000, to be used in aiding young men in scientific study. It is understood that this sum is not the whole measure of the donor's generosity, which will be repeated as often as there is real necessity for it.

WE published last week a circumstantial account of the largest manufactory of locomotives in this country—the Baldwin Locomotive Works in Philadelphia. It is a proof of the immense extension of railway construction in the United States that the number of engines made there is larger than the total make of any other similar establishment in the world. It is true that the BALDWINS have a large demand from countries outside of the States; but this fact is only additional evidence to the excellence of American work, and to its cheapness also. Nothing but business ability of a high order, combined with the proverbial American ingenuity, could produce such a result. Compared with foreign establishments, American works cannot be considered colossal; for we have not one that can compare in extent with any one of perhaps half a dozen that might be selected in Europe. On the Continent, Berlin, Essen and Creuzot have works which are not only larger, but possess more varied facilities for meeting the endless demands of European engineering, while in England there are vast establishments, as might be expected from the great center of supply for more than half the world. But we doubt if any foreign works which confines its attention to one or two specialties can exceed in productive capacity such a workshop as that founded by MR. BALDWIN. Circumstances force the division of labor on the grand scale to its highest development in this country, and the simpler character of American railroad construction, as a whole, favors the success of the system. We cannot but look with pride upon such an achievement as that embodied in the Baldwin Works, which, having been accomplished under the most unfavorable conditions, is an earnest of the greater work that will be done when our commerce and manufactures revive completely from the great disaster of the war. The Baldwin Locomotive Works are in the hey-day of a prosperity, which we have the greatest faith will be immensely increased by the new conditions introduced into national competition by the very general rise in prices abroad.

Planted Forests—Will they Succeed on the Plains?

THIS question is one that necessarily has an increasing importance as the population of the great West thickens and spreads further from the line of the Mississippi River. It is already one which can be no longer neglected, and it has, in fact, been taken up in a practical way by Congress, which has offered a land bounty to those who plant a certain area of forest. A good beginning has been made, but for the success or failure of the experiment we must wait some years. Just at this juncture the Report on the Geology of Ohio appears, in which Dr. NEWBERRY discusses the problem at length, under the head of "the Origin of Prairies," and we think his conclusions important enough to warrant us in giving a resumé of them. A number of theories have been proposed to account for the existence of the immense areas devoid of forest, and occupied only by grasses, which form so marked a feature of our country.

1. Mr. LEO LESQUEREUX thinks that the prairies are old lake beds, first occupied by aquatic plants and then filling up with grasses as the drainage improved. These exclude trees simply because they hold complete occupation. A similar action may be observed in the transformation of shallow bays into grassy marshes, which is a common phenomenon along rivers and lakes, and it is certain that the western, or rather the central, part of the continent has progressed from an unbroken sheet of water, through lakes gradually lessening in size, to the state of dry land. This state of things produces a peculiarly fine soil, which is better fitted to the growth of grasses than of trees.

2. Prof. WINCHELL has suggested that the vegetation of the prairies is preglacial. That it is in fact a remnant of the flora existing on the earth before the movement of the great sheets of ice that have had so powerful an effect in moulding the surface in the earth in its present form. When the ice and water of the Drift period receded, the earth was covered with vegetation which sprung from seeds that had preserved their vitality through the long glacial winter. It is evident that the plausibility of this theory depends closely upon the length of time during which seeds can retain life.

3. The annual prairie fires are pointed to as a reason why there should be no trees in the districts visited by this scourge of vegetable life. Trees would fall a victim to the heat which, while it destroyed the tops of the grass, would leave its roots unharmed. Undoubtedly the luxuriance of the grassy growth on the prairies is due, in some measure, to the fertilizing effects of these fires.

4. The firmness of the prairie soil has been pointed out as the cause. Trees require a more open soil than the fine, compact loam of the prairies.

5. Dr. NEWBERRY is unable to agree with any of these theories. The theory of Mr. LESQUEREUX, and also that last mentioned, are inadmissible, because every kind of soil is found in the prairies, or in the greater plains, which are also treeless. The traveller there finds all varieties of soil, coarse or fine, loamy or gravelly, equally bare of trees. In the very midst of the area, however, the water courses are found to be lined with tree vegetation, and the mountains are covered with it. It is impossible to connect the barren parts with the character of their soil, or with their lacustrine origin, because the wooded parts—except the mountains—have the same soils and the same origin. Nor is the supposition that the prairie grasses may be a legacy to us from pre-glacial times well founded. Geologists are tolerably well agreed that the change of temperature, which was the cause of the glaciers, must have occurred not less than 200,000 years ago, the last period of great eccentricity in the earth's orbit. It is hardly possible that seeds could have preserved their germinating power so long and under such adverse circumstances. Dr. NEWBERRY therefore traces the origin of prairies to the hygrometric conditions which obtain in those regions where they exist. According to him, trees are absent because there is too little rainfall or other source of moisture to sustain their life.

He finds seven great distinctive areas of rainfall in this country:

1st. Lying between the Mississippi and the Atlantic, with 32 to 60 inches of annual rain and generally well wooded. 2d. From the Mississippi to the Rocky Mountains, having 10 to 30 inches of rain. 3d. The Rocky Mountains, well watered and wooded. 4th. The great basin between the Rocky and Sierra Nevada Mountains, with 2 to 16 inches rain and sterile. 5th. The Sierra Nevadas, well

watered and heavily timbered. 6th. The California Valley; rainfall limited and intermittent; timber along the permanent streams. 7th. The coast mountains, well timbered.

He reasons that these alternations cannot be due to any but general causes, and the chief of these must be the supply of rain. Trees need a tolerably even average supply of water. The deficiency of winter rain or snow on the plains is enough to prevent their growth, and even if this were not so, periods of absolute drouth, lasting for one and even two years, have been reported by the Indians and others, and had any forest been in existence on the areas covered by that calamity it would now be a dead one. Trees not only need a sufficiently high yearly average of rain, but they cannot bear a long continued deprivation of it. Even the fluctuations, which are not uncommon in the forest regions, are often disastrous to them, as the effects of one dry winter or summer have often proved. Forests are not commonly formed in those parts of the country whose rainfall sinks below 30 inches of water, and if 20 inches is assumed to be necessary to the healthy growth of trees, it is plain that a forest, planted or natural—in one of those belts where the rainfall is below 30 inches—would be subject to fluctuations which would soon destroy it. If 60 inches cannot protect the trees on the Atlantic coast from occasional damage, it is pretty certain that 30 inches in the interior would sometimes be powerless to prevent the most serious catastrophe to forests. The plains with but from 2 to 16 inches have not water enough to support tree growth in the best season.

Holding this view, it is not strange that Dr. NEWBERRY has no flattering expectations of success in the present experiments. He does not deny that progress may be made. The fineness of the prairie soil and the recurrence of annual fires, while not the originating causes of prairies, undoubtedly help to extend their area, and these are causes which may be remedied. Wherever the existence of prairies depends on these things, forests are likely to succeed. By planting around the edges of the prairie tract, better hygroscopic conditions may be induced which will favor the extension of the forests toward the interior. Forests have in fact been planted and succeeded unexpectedly well in Illinois, Wisconsin, Kansas, Iowa, and similar States which lie within areas of sufficient rainfall. But the conditions are different on the plains, and it can hardly be expected that the mere planting of young trees will overcome those organic difficulties which have thwarted the efforts of Dame Nature in the same direction. Those who have chosen lands which lie within the shelter of the mountains may succeed, but we fear that the chances of forests on the open prairies—just where they are most needed—are but very dubious. We make no predictions. The experiment is now in progress, and we can all afford to await its result. But it seems to us that if the Government is anxious to encourage a sound system of forest planting in the West, it will do well to limit its bounties to those regions which have the best chance of succeeding in the work.

EDITORIAL CORRESPONDENCE.

The Vienna Patent Congress.

VIENNA, Aug, 11th, 1873.

THE Congress for the inauguration of a movement towards an International Patent Law has just adjourned. In some respects it was an important gathering, though not endowed with any diplomatic or other official authority. Mr. THATCHER, the representative of the United States Patent Office, did not, I believe, become a member of the Convention; but he was invited to address it, and occupied several hours in an explanation of the principles and details of the American system. American inventors were well represented by such men as REMMINGTON, HOTCHKISS, HALL and others, who were reinforced from the ranks of science by such men as BLAKE and JOY. HAMILTON HILL, of Boston, was one of the Vice Presidents.

The work of the Congress consisted in framing a declaration of principles; and this was no easy matter. There were at least three parties, distinctly defined and very much in earnest: the thorough-going opponents of patent systems; the advocates of a qualified patent system, controlled by the State so as to prevent monopoly, and resting upon the proposition that the privileges conceded to an inventor are a trust, but not a right vested in him; and finally, the American party, as it may be called, which insisted upon the inventor's right of property in his invention, considered the patent as a *quid pro quo*, paid for that right, and claimed that policy as well as justice required his control over it, during the period agreed upon between him and the State, to be as free as any owner's control over any property.

The first party was small, and made but little impression, being, in fact, scarcely at home in a body which was tacitly understood to mean progress in the direction of the patent system. The American theory was too radical, or smacked too much of the dreaded word "monopoly" to be acceptable to the mass of German delegates; but the defenders of that theory were active and strong, and the fact that they had behind them a great country, in which their ideas were already in successful operation, lent force to their arguments. It turned out, therefore, that on every point but one, great concessions were made to them, and on that one point, (of which more hereafter,) they might have won a substantial victory had they acted together.

The Congress was opened Aug. 4 by BARON SCHWARZ, Director-General of the Exposition, who was elected Honorary President. Mr. WILLIAM SIEMENS was President, with several Vice-Presidents and Secretaries. Mr. SIEMENS conducted the proceedings with much address, speaking in French, German or English as occasion required. As a rule, the speeches were delivered in German or English, and all documents were prepared in these two languages.

A preparatory committee was appointed, consisting of eight or ten members—among them Messrs. HAMILTON HILL and W. P. BLAKE, from the United States. This committee reported a series of resolutions, the framing of which cost a lively discussion, while their consideration by the Congress proved to involve a vast amount of public and private debate. The first instalment, adopted on the 5th, was cut down to the enunciation of general principles, and passed in the following form:

I. The protection of inventions is to be guaranteed by the laws of all civilized nations under the condition of a complete publication of the same; because:

a) The sense of right of civilized nations demands the legal protection of intellectual work.

b) This protection affords the only practical and effective means of introducing new technical ideas, without loss of time, and in a reliable manner, to the general knowledge of the public.

c) The protection of invention renders the labor of the inventor remunerative, and induces thereby competent men to devote time and means to the introduction and practical application of new and useful technical methods and improvements, or to attract capital from abroad, which, in the absence of patent protection, will find means of secure investment elsewhere.

d) By the obligatory complete publication of the patented invention, the great sacrifices in time and of money, which the technical application would otherwise impose upon the Industry of all countries, will be considerably lessened.

e) By the protection of invention the secrecy of manufacture, which is one of the greatest enemies of industrial progress, will lose its chief support.

f) Great injury will be inflicted upon the countries which have no rational patent laws, by the native inventive talent emigrating to more congenial countries, where their labor is legally protected.

g) Experience shows that the holder of a Patent will himself make the most effectual exertions for a speedy introduction of his invention.

Here the Congress might well have paused, content with a preliminary general declaration, and leaving the discussion of details to a permanent committee and a subsequent, more carefully constituted and less hurried assembly; but some of the members, and particularly Mr. WERNER SIEMENS, a brother of the chairman, insisted on a declaration by the Congress of the principles which should underlie an international patent system. This opened Pandora's box. In the preparatory committee, Mr. SIEMENS was forced to yield several points to the friends of "inventors' rights;" and the scheme proposed to the Congress on the 6th was as follows:

II. An effective and useful patent law must have the following basis:

a) The inventor or his legal heir alone can obtain a patent. This patent cannot be refused to a foreigner.

b) A patent of invention must either have a duration of fifteen years or be able to be prolonged to that time.

c) The granting of a patent must be accompanied by a detailed and complete publication which renders possible the technical application of the invention.

d) The cost for the granting of a patent must be moderate; yet, in the interest of the inventor, an ascending scale of taxes must be established, in order to annul a useless patent as soon as possible.

e) By a well organised patent office it must be easy for any one to obtain the specification of a patent as well as to see what patents are still in force.

f) It is desirable that measures be adopted by which the patentee should be compelled (for a fixed, adequate compensation) to allow any one to use his invention who may desire it.

For the rest, and particularly in respect to the proceedings in the granting of patents the Congress refers to the English, American and Belgian Patent law and to the Patent laws drawn out for Germany by the Union of German Engineers.

To the declaration *f* a stern opposition was made, chiefly by the American members. They could not grant the principle involved in forcing an inventor to license everybody to use his invention. Mr. BLAKE made an excellent speech against it, of which the substance was as follows:

"The inventor has from the nature of the case a perfect right to his invention. He can give or withold it as he chooses. Whatever view we may take of his moral obligations to his fellow-men, the inherent right of control remains, and we cannot legislate it away. When the inventor takes a patent, he makes a contract. If a contract offered him is not in his favor, he hesitates before entering into the agreement, and perhaps avoids it, and keeps his invention a secret. We have agreed that judicious patent laws stimulate invention and industry. Any provisions of the law tending to diminish or to control the inventor's right are at least questionable, and we should avoid them. The interest of the inventor is the best protection the public can have. As a general rule, the inventors use due diligence in putting their inventions before the public. Their action in this respect should be encouraged, and we should not abridge their rights."

The party represented and led by Mr. WERNER SIEMENS, on the other hand, pressed the resolution on the plea that it would be impossible to get the German Empire into an international patent system without this provision. They seemed to think the "concessions" made already to American feelings gave them a right to ask that this point should be yielded in return—forgetting, or ignoring, that the invertor's absolute control of his own property and business is the corner stone of the American system. There is really no reasonable middle ground between the no-patent theory and the American theory. The Americans insisted

that the obnoxious paragraph should be rejected or passed over. A day was spent in attempts at compromise, all of which proved futile; it was agreed on the part of the Americans that on the 8th the motion should be made to lay this paragraph on the table, and the Editor of the ENGINEERING AND MINING JOURNAL was put forward to advocate this course, which would simply eliminate from the declarations of the Congress all allusion to the troublesome point. On the morning of the 8th, however, it appeared that two of the American delegates, Messrs. HALL and HILL, had been "talked over." A declaration in milder form, drawn by the ever-ready Mr. WERNER SIEMENS, asserting that the inventor should be "held" (not "compelled"—oh, no!) to license all *bona fide* applicants *whenever the public interest required it*, was fathered and introduced by Mr. HALL, and supported, as the best that could be secured, by Mr. HILL. This defection in the American ranks naturally defeated the movement already agreed upon with good prospects of success. The motion to lay the subject on the table was made, and supported in a speech, the English translation of which I may hereafter find time to send you. It had the effect of dividing the German vote; but the action of Messrs. HALL and HILL and their followers nullified this advantage. Those gentlemen may congratulate themselves that they have sacrificed an important point for nothing. The idea that a government can step in and tell an inventor at any time that "the public interest" requires him to revoke the exclusive licenses he has issued, and for which he has been paid, and to license every comer, is too absurd to need comment. At least, it is thoroughly non-democratic. The HILL-HALL resolution is of course harmless, compared with the one for which it was substituted; and it may even be regarded as a triumph of the American party. So much the worse The American party (by which I mean merely those who believed in inventor's rights, according to the American theory) was strong enough in logic and in numbers to obtain what they fairly and modestly demanded—namely, the omission from the declaration of the Congress of everything like a proposition for the compulsory governmental supervision of an inventor's business. But it was betrayed by its own members, and when it might have won all, it got merely HALL instead—which was very much less. Mr. HILL, I believe, with some fore-running suspicion of the view which will be taken at home of his action, is inclined already to regret it. If any future misunderstanding or difficulty in the course of international negotiations should arise from the unlucky paragraph referred to, the ENGINEERING AND MINING JOURNAL will take sad satisfaction in perpetuating and intensifying Mr. HILL's regret. Meanwhile, the matter does not, in its present aspect, deserve more extended comment. It was a tempest in a tea-pot, after all; and it will probably not so much as ruffle with a breeze the currents of opinion and of business in the United States.

In addition to the resolutions already mentioned, the Congress passed one in favor of immediate reform in the direction of harmony among national patent laws; also one in favor of a "preliminary examination" as a part of patent law; and finally, a resolution authorizing the preparatory committee to continue the work undertaken at this meeting, and instructing it to use its influence in behalf of the principles laid down, to secure an interchange of ideas upon the subject, to call meetings and conferences of the friends of patent protection, and to form an international organization. It is to be known as the International Patent Congress Committee. Baron SCHWARZ is the Chairman.

On the last day of the Congress, Baron SCHWARZ thanked the members in the name of the Emperor and the Archduke for their attendance and discussions. He hoped that all might meet again at the Philadelphia Exhibition. Mr. BLAKE, as the representative of the Centennial Commission, said they would all be cordially welcomed at Philadelphia, and would be afforded as good an opportunity to discuss the questions before them as they had enjoyed in Austria.

Whereupon, votes of thanks, compliments, dinners and receptions, etc., etc.

R. W. R.

CORRESPONDENCE.

Ore Separation—Wet or Dry?

TO THE EDITOR: SIR—Availing himself of your editorial concession that there were two sides to the question of ore separation, Mr. E. G. SPILSBURY, in your Journal of August 5th, whilst declaring himself "a staunch advocate of the wet system," very justly and liberally favors "a fair and open discussion on the subject," in the interest of mining engineers generally.

The arguments most readily used, and adroitly, too, against the "Air System," have been mainly those of cited experimental failures, theories and systems wherein air, as the medium, failed to sustain the merits claimed by the inventors and experimentors. Go back in the history of experiments, theories and systems wherein water as the medium also failed for the last fifty years, or even during the last five years, and it will be seen how utterly vain and worthless such arguments become. Whether or not success attended the use of air, heretofore, *in a particular device* is not the question, and intelligent men, wide-awake to the possibilities of progressive invention, should be careful not to argue against a principle or means simply because the devices hitherto employed, failed to produce sustained satisfactory results. To such men it need only be remarked, that while unsuccessful devices do not demonstrate the inutility of a new medium, it may be that occasional good results strongly prove its utility, and that such results might be constant if the device was entirely correct in form and adaptation. Attention should be confined to what is claimed for the present best improved device for the use of air as the medium of separation, and the results constantly and reliably obtained in experimental and in practical working. Nor will it be satisfactory to discredit these results because the mathematical calculations taught at Freiberg furnish no formulas to account for such results on mathematical principles. They must be taken as they are, and reasons given why the same machine driven by power and air obtained locally from different atmospheres, will not produce the same good results continuously. Mr. SPILSBURY kindly furnishes information concerning some special machines referred to in a former editorial of yours, and in so far as we are interested in said machines the information is valuable, but it strikes me that the public will be more benefitted by a smart demonstration that the results achieved by the Krom Dry Ore Separator are not good results because water ("the laws of which are mathematically known,") was not used, although the use of water has never produced results as good. In fact this is the question to-day. The Krom machine uses air and produces practically superior results to those produced by water, and it is now the duty of the water advocates to show in a lively and interesting manner that such results are not good, because nothing is said of their possibility in the books or drawings by such able men as RITTINGER. So soon, however, as these school-men, all of whom (unconverted) are, like Mr. SPILSBURY, staunch advocates of the water system, can set aside the oracular wisdom of educated prejudice and take up the results and facts of present achievement, they will see that *air* is the better medium reasonably and logically.

It is assumed that the ultimate perfection of water dressing is now found in the water jig. In this the principle is simple—viz.: submitting the ore to the action of intermittent impulses, suddenly lifting the body acted upon, and then allowing a free subsidence of all the particles so that each may, as nearly as possible, fall according to its specific gravity.

In like manner the ultimate perfection of air dressing is now found to be in a like intermittent action suddenly lifting the body of ore acted upon, the subsidence here also allowing each atom to act on its own gravitating laws. Now assume two machines to be constructed, each one perfectly adapted for the best employment of its peculiar medium, the one water, the other air. Experiment has proved that the number of impulses to be given to, or by, water cannot exceed 100 per minute—if more frequent, there is no subsidence. This is the limit of this active principle when using water for effecting separation by impulse and subsidence. In the use of air, from 450 to 500 impulses may be given per minute without destroying the principle of impulse and subsidence. Is there then a reasonable doubt that, on the same quantity, the separation of light from heavy will be as 1 to 4 in time?

In the water jig, the same fluid which causes the upward impulse, also stays with and must accompany the ore to be discarded as tailings. This water is, in fact, the vehicle to transport the separated stuff, and in so far as the separation is not perfected, there is no remedy against the flowing away of valuable mineral. If this was the fact with air, common sense would at once say that under like circumstances air would carry off less of the valuable material than the water, inasmuch as air is very much lighter than water. But in the case of air, the medium or fluid which causes the upward impulse does not stay with, nor accompany, the ore to be discarded as tailings. This *air* does its work and leaves, mingling with the atmosphere, and the only flow is that of the tailings.

The following points are emphasized:

1. Water admits of but 100 impulses per minute. Air admits of 400 to 500.

2. In water, subsidence is delayed and less active than in air, because the former is more dense than the latter; hence the interchange of particles in a vertical line cannot be as free and unimpeded with water as with air.

3. In water concentration, from necessity, there must be a constant forcible flow of the fluid, while in air concentration there is no flow whatever, only an upward departure of the agent or air.

4. The denser medium, under the same circumstances, must carry off more than the less dense, hence, if the flow of the air were the same as the flow of the water, the former would carry off less than the latter.

The agitation of the ore, whether by water or air, is in effect the same, excepting in this, that the ore particles have less interference in air than in water, and hence results are obtained by the use of air not possible by the use of water. As, for instance, nearly all the metallic particles, whether coarse or fine, (even as fine as 1-45,000th of an inch,) will generally be found together, showing that the concentration of the metallic grains takes place without regard to size. A like fact cannot be demonstrated in water. This one fact constantly resulting in air concentration, conclusively proves the superiority of air as a medium, and at the same time very clearly shows that the Krom machine embodies principles hitherto not used in air machines, from the failures of which arguments against the use of air have been so liberally drawn by the advocates of water dressing.

Yours, G. W. BAKER.

"Blowing In" Blast Furnaces.

A writer in the *Practical Magazine*, who evidently has more than a superficial knowledge of both the theory and practice of blast furnace management, says:

There has always been a certain amount of mystery, and yet one really scarcely knows why, attached to the operation named above, and which we are about to describe. As a general rule—at all events until later years—the practical management of blast furnaces has been entrusted to men who had risen, as it were, from the ranks, having in most cases been originally founders, casters or even cinder fillers, and who, though producing sometimes very excellent results, were utterly ignorant of the chemical principles of the operations they were conducting, and

worked rather by the rule of the thumb than any other. This state of things naturally produced a certain reticence on their part—a belief, perhaps, that they possessed some invaluable secret method of treating their furnaces, and certainly, to our own knowledge, an unwillingness to give, even to their employers, more information as to the burdens, pressure of blast, etc., than was actually made compulsory on them. Indeed on this point we recollect one very successful furnace manager in South Wales who persistently refused to give in at the office anything more than the average burden of the week. Any details of immediate changes were always carefully withheld, or, as he liked to express it, he preferred "to throw the things together," which simply meant giving totals without particulars. Things are very much changed since then, and the theory of the blast furnace has formed the subject of extensive and very accurate investigation at the hands of such scientific men as Ure, Bauermann and Lowthian Bell.

The mere operation of blowing in—*i. e.*, starting smelting operations in a blast furnace—has not, we think, however, been very frequently described; and it is to that process of iron matallurgy we devote the present article. Presuming that we have our furnace stack built and completely fitted according to the designs decided upon, the first and most necessary proceeding in commencing operations is to get it well and thoroughly dried, any dampness remaining about the hearth being almost sure to produce a setting of the iron there, and probably no end of trouble and labor in cutting in and tapping times; whilst if the upper part be not also dry, there will be an extra risk of scaffolding, and possibly a tendency, on the heat rising to working point, to a cracking and opening of the masonry, attended, of course, by an escape of gas and other inconveniences. On the first lighting of a fire on the hearth, for which any fuel will do, we have generally been in the habit ourselves of stopping up the tuyere arches with fire clay, leaving the setting of the tuyeres themselves until it was determined to go on with the regular filling—this equally with coal, coke or charcoal. We have found it advisable to fill up in the first instance to the full capacity of the furnace with fuel alone, and then, after placing the tuyeres, to put on a weak volume of blast. With charcoal furnaces a pressure of from a quarter to half a pound to the inch will be found sufficient, but with coke or coal a somewhat stronger pillar will be found desirable. The result of this will be the gradual formation of a certain quantity of clinkers and ashes, which should be periodically removed by forming a scaffold of ringer bars over the top of the dam-plate, which, supporting the superincumbent fuel, enables the furnacemen thoroughly to clear from the breast the whole of the hearth; and we think it is an exceedingly good plan to allow a portion of the blast flame to escape through the tapping hole—of course only until the first of the iron reaches the hearth—as it is thereby thoroughly heated, and any tendency to chill the metal, or cause it to set, is thereby prevented. Once certain that the hearth is thoroughly heated, the ore and limestone charges may be commenced; although we believe that in some instances these are filled whenever the blast is drawn on, the manager trusting, of course, to the quantity of fuel already in the furnace being sufficient for its perfect drying and preparation for the descent of the iron. With charcoal furnaces there is but little difficulty at this point, but stone coal and coke require great care to prevent adhesion and the consequent scaffolding; indeed, bituminous coal will sometimes bake into large masses and cakes through which it is absolutely impossible that any air can pass; combustion is hence necessarily checked; and these masses have frequently, on their reaching the timp, to be broken up by means of ringers and hand bars, and dragged out over the dam-plate. Another plan, however, is to put on a proportion in each charge of old castings or scrap pig iron, which of course comes down very fluid and hot, and fairly eats through and breaks away any scaffolds that may have formed. A certain amount of anxiety usually attaches to the earlier casts from a newly blown-in blast furnace, not only as regards the quality of the metal which may result, but also from the difficulty which sometimes arises at these stages, resulting generally from the want of sufficient heat, and the consequent setting or chilling of the iron as it reaches the hearth in getting the tapping bar driven in. We have seen in cases of this sort a quantity of charcoal piled in front of the tap hole, and by leading a small jet of blast around to it from the tuyere pipe, such an intensity of heat produced as readily to melt away any obstruction. After, however, a week's quiet work at moderate charges, should all go well, the pig—gray, or good healthy white—and the cinder well separated and running freely, the burden may be put up to its full weight, and, in say three weeks, the furnace ought to reach the proper out turn. How immensely this has been increased of late may be gathered from the fact that some twenty years ago 200 tons of forge pig iron per week were considered in the South Wales district a more than average production; whilst at some American works, notably those at Carondelet, between 400 and 500 tons of pig are regularly run out every week, and the proprietors anticipate, from some new stacks being erected, a large increase even on this. At these works, too, another not unimportant measure of economy has been taken. It is well known to all practical men that the points at which a blast furnace first commences to wear out are those of the zone, say about two feet in height, which lies immediately above the tuyeres, and to check this tendency, water-backs, or jackets, of wrought or cast iron, with water-tight compartments running through them and kept constantly filled with water, are placed in the exterior walls, and this arrangement is found to check or modify the destruction of the fire brick lining. We have ourselves seen something similar to this tried in the shape of water boshes placed immediately above the tuyeres, with the effect generally, however, of lowering the quality of the iron produced. In a paper such as the present we can not, of course, enter into the varied question of hot or cold blast, character and position of tuyeres, etc., but we may, perhaps, in conclusion, say that our experience certainly goes to prove, whatever may be its effect on quality, that hot blast facilitates the operation we have attempted to describe—*i. e.*, "blowing in."

Victoria and Her Mineral Resources.

LITTLE more than twenty years have elapsed since the great mineral wealth of our Australian colonies was ascertained. Copper and tin were known to exist, and beds of coal had been accidentally found at Newcastle. It was not, however, till the gold fields were discovered that the impetus was given which has made Australia flourishing and populous, whilst enriching the Mother Country. The tales received from California of the wondrous doings in that region had inflamed men's minds. BAYARD TAYLOR'S Eldorado, with its romantic account of his visit to San Francisco, had frightened our Government authorities. They feared that were gold diggings to be found in the colony it would attract the population from the more steady pursuits of agriculture. Count STRELECKI, the great Polish traveller's report of his discovery of gold in the neighborhood of Melbourne was, consequently, kept studiously concealed by the authorities at the Colonial Office. Chance baffled all the precautions taken. The world heard the news in wonder that fields as rich in gold as those of California had been found in what is now called Victoria. Thousands of people from every known country rushed to the spot. For a moment the search for gold absorbed public attention in the neighborhood, to the exclusion of all other pursuits. Men's minds, however, calmed down shortly. A certain number devoted themselves entirely to digging; the others applied themselves to raising the necessaries to supply their wants. Large quantities of gold dust were exported. Victoria became one of the great gold-producing countries of the world, and from that time down to the present moment has gone on steadily furnishing an unfailing yield. It is estimated that from the discovery of the gold fields, up to the 31st December last, Victoria has raised no less than the enormous value of 168,149,-305*l.* of gold. Judging from the relative proportion of gold exported to that retained in the colony from the returns of the last two years, by far the larger portion of the above amount must have been sent out of the country. In return the colonists have received its value in commodities of more utility to them in their position, and the wealth thus accumulated and increasing has made Victoria one of the most prosperous countries in the world. Its rise, in fact, has been one of the marvels of this century which will form the theme of many a future historian's book. At the present time the work of digging has resolved itself into a regular system. The first flush of discovery is past. Nuggets are no longer found lying on the surface waiting to be picked up. Complicated machinery and extensive mining operations are required to get possession of the precious metal; but if the profits are not so sudden they are continuous. The search has been removed from the realms of the speculative to the positive, and is a special and remunerative form of recognized industry.

The number of miners employed in the colony on gold mining during 1872 has been estimated by the authorities at 52,965, of which 14,158 were Chinese. These figures show a falling off of 3,452 from the preceding year, of which 1,511 is in Chinese miners. The 52,965 may be divided as follows: 36,141 employed in alluvial mining, and 16,824 in quartz mining. According to the *Melbourne Argus*, the earnings of these respective classes were, 159*l.* 0s. 6½d. for the quartz miners, whilst those of the alluvial miners are computed at 95*l.* 0s. 6½d. during the year. The total amount of gold raised was estimated at 1,331,377 oz., which, divided amongst the 52,965 men employed in raising it, would give an average earning of 93*l.* 6s. to each. Many, of course, worked for less periods than a year. Up to the end of 1872, 3,224 distinct auriferous reefs had been either opened up or prospected, and the area of the quartz and alluvial ground opened up was 1,026 square miles. The following are the relative returns of the past two years. According to reports of the Commissioner of Trade and Customs there was exported 1,355,477 oz. in 1871, and 1,160,555 oz. in 1872; received at Melbourne Royal Mint, 121,966 oz. in 1872. The estimates of the mining registrars state the amounts raised to have been 1,368,942 oz. in 1871, and 1,331,378 oz. in 1872. The returns made by the bank managers show that the amounts purchased by the banks were 1,290,845 oz. in 1871, and 1,218,094 oz. in 1872. The yield of gold from veinstuffs for the two years was, in 1871, from 924,705 tons of quartz crushed, 484,303 oz. (10 dwt. 11·39 gr. per ton); from 167,197 tons of quartz tailings, cement, mullock, etc., 21,914 oz. (2 dwt. 14·91 gr. per ton); and from 3,562 tons of pyrites, blanketings, etc., 9,114 oz. (2 oz. 11 dwt. 4 gr. per ton); and in 1872, from 945,571 tons of quartz crushed, 568,382 oz. (11 dwt. 21·81 gr. per ton); from 67,183 tons of quartz tailings, mullock, etc., 8,978 oz. (2 dwt. 16·11 gr. per ton); and from 5,009 tons of pyrites, blanketings, etc., 13,636 oz. (2 oz. 14 dwt. 10·83 gr.) On comparing the above figures it will be seen that there has been a considerable increase in the yield of gold from quartz, though there has been a slight falling off in the amount of quartz tailings and mullock which has been treated. The returns of cement give 69,300 tons crushed, yielding 12,820 oz., or 3 dwt. 1,880 gr. per ton. This may be regarded as very satisfactory. The quartz, however, of which the returns on 9,482,895 tons up to December, 1872, have been got together, shows a total result of 5,307,205 oz. or an average of 11 dwt. 4·64 gr. per ton. From the quartz tailings the average yield from 1864 to 1872 inclusive was 3 dwt. 16·57 gr. of gold per ton. The pyrites and blanketings treated during the years 1869-'72, according to the information received by the department, and which embraces an amount of 15,151 tons 9 cwt., gave 35,721 oz. 8 dwt. 17 gr. of gold, or at the rate of 2 oz. 14 dwt. 7·76 gr. According to the statistics collected respecting

the puddling and sluicing of dirt obtained from the alluvial deposits and deep leads, 1,553,453 tons yielded 98,536 oz., or 1 dwt. 6·45 gr. per ton. From the above information a correct idea of the wonderful resources of Victoria may be formed, and the relative value of its gold fields and those of other countries justly estimated.

Besides gold miners there were 358 men employed in other sorts of mining—203 for tin, 29 for copper, 42 for antimony, 15 for lead, 2 for iron, 34 for coal, and 33 for slate and flags. The total produce up to the end of 1872, of other minerals besides gold, has been estimated by the authorities at—silver, 5,281*l.*; tin, 282,105*l.*; copper, 5,810*l.*; and antimony, 77,237*l.* For last year the statistics show that 850 oz. of silver were obtained. The exports of tin ore were 294 tons 19 cwt., and of tin 92,960 lb.; of copper ore 5 cwt. It also apears that there were raised during the year 1,573 tons 15 cwt. of antimony ores; and that 1,408 tons 1 cwt. of ore, and 39 tons 8 cwt. of antimony regulus were exported. The quantity of lead ore raised during the year was 100 tons; the quantity exported 6 tons 5 cwt. The coal raised was 10 tons 8 cwt. The quantity of kaolin raised during the year was 2 cwt.; that exported 25 tons—this had been raised during the previous year; and 25 tons of flagging were raised. From what has been stated the great mineral wealth of Victoria will be apparent, as it will also be that to gold is her present prosperity chiefly attributable. It is not, however, to be doubted that her other mineral resources will be developed with time, and the fact that the examination of mining surveyors by a competent Board, which is now introduced, and, as it appears, highly appreciated, will greatly conduce to this end.

MINING SUMMARY.

Arizona.

MOHAVE COUNTY.

CEDAR VALLEY.—Mr. H. A. EASTMAN, arrived here about the middle of the week, from this county. In a conversation with him, we learned that a great deal of work is being done in Wallapai and Cedar Valley districts, that a new nest of ledges has been found beyond Cedar Valley district, to which men are rushing.

PIMA COUNTY.

COPPER.—We see by the Tucson *Citizen* that Mr. BROWN, of Tucson, has had men at work on some copper lodes west of Tucson—said to be rich— which he is about to "patent."

YAVAPAI COUNTY.

NEW DISCOVERY.—The recent discovery of a pretty rich silver lode, near Bowers' Agua Fria ranch, about 18 miles east of Prescott, has raised quite a breeze in Prescott and vicinity. The first specimens from the lode were brought to town last week, by Col. JAMES M. BARNEY and Mr. WM. B. HELLINGS. They contain silver in various combinations. The rock is of a dark reddish color, compact and close grained, just such rock as we would stoop to pick up in almost any mining locality. Assays of it have been made by Mr. L. B. JEWELL of this place, not one of which has given a poorer result than $800 to the ton, while others went away up into the thousands.

Upon these results having been made known, there was quite a rush to secure extension claims on the lode, which is now located for an immense distance. Mr. HERBERT BOWERS was one of those who struck for the ledge Tuesday last. He has since returned with the flattering news that, besides being rich, the ledge is large.

Messrs. BARNEY & HELLINGS have control of several hundred feet of the lode, and will straightway set men at work upon it, and ship some of the ore to San Francisco. They may, ere long, work the ore at the mine, good facilities for this purpose being close by.

TIGER.—Governor Safford has moved in the good cause of trying to induce capitalists to take hold of the Tiger mine, in Bradshaw district, which he looks upon with great favor, thinking it a second Comstock. He has written to persons in London, who desire to purchase good property of this kind.

WAR EAGLE.—JACKSON & Co. are still working the War Eagle lode, and other parties are taking ore from other ledges in the vicinity.

BENJAMIN.—We have no later news than that published last week, from Mr. A. O. NOYES, concerning the resumption of work on the Benjamin mine, near Prescott, a mine that is too rich to be allowed to much longer remain idle.

WALNUT GROVE.—Colonel CANY returned to town last week, from a trip to Walnut Grove and Weaver districts, in both of which he says many good lodes exist. He is preparing for a trip to San Francisco, with the view of inducing moneyed friends there to invest in some of the mines.

SMITH'S MILL.—The news from Smith's mill, near Wickenburg, is, of course, encouraging. The mill is running and paying handsomely. The success of its indomitable proprietor is now settled, and well does he deserve success.

BIG BUG.—Mr. BASHFORD, of this place, is in receipt of a letter from the Big Bug Mining Company, which letter informs Mr. B. that the mill is in good condition, ledges as rich as ever, so that the closest scrutiny of the keenest mining sharp cannot find a flaw in this splendid property. About the usual amount of placer mining is doing in this vicinity, and gold dust is not all scarce.—*Mining and Scientific Press.*

Nevada.

PIOCHE MINING ITEMS.

From the Record of August 10.

The American Flag mine looks unusually well throughout, all the stopes showing a marked improvement. Working the usual force. During the past week a connection has been made by pipe between the mine and the upper tank, thereby securing an abundant supply of water for all purposes, and rendering the works doubly secure in case of fire. The company's mill is running temporarily on ore from the Newark mine, and, as usual, is giving a good account of itself.

The Alps is working twenty-one men and hoisting about five tons of ore daily. The Amador mill is now running on ore from the Alps. About 240 tons is to be crushed, and the bullion returns may be looked for about the 15th instant. The ore is of a high grade. The winze on the 154 foot level is down 45 feet in ore which assays well.

In the Pioche there are now on the dump fifty tons of ore. The assay of the car sample of August 9 was $207 24. This ore when milled will, therefore, yield about $140 per ton. The new shaft is completed to the depth 175 feet. It is calculated that the ledge will be struck at a depth of 900 feet.

In the Meadow Valley there is no change to note at present. Work is just now suspended in No. 5, on account of an accident to the machinery. It will be resumed, however, in about five days.

In the Havana, day before yesterday, the east drift was started on the vein, at the 250 feet level. The face of the drift is all in ore, of a very high grade. It is the intention to erect hoisting-works as soon as practicable.

In the west drift of the Washington and Creole, in which no ore had been previously found for some time, a ledge of first-class ore, one foot and a half wide, has been struck.

In the Raymond & Ely work was resumed last week with 160 men. There is no change in the character of the ore, seventy-five tons of which are taken out daily. Shipping ore was commenced on Friday.

The Bowery is sinking the main shaft, and taking out the usual amount of ore.

In the Chief East Extension they are stoping $225 ore from the 225 foot level.

WHITE PINE COUNTY.

Correspondence of the San Francisco *Mining and Scientific Press.*

TEA CUP MINE.

This location, consisting of 1,500 feet, Hunter Safford & Co., owners, begins at a point midway between the Delta and the Mountain View; it runs in a direction nearly north and south, and dips to the west. The hanging wall is a slate shale, 300 feet thick; the foot-wall, limestone. The development upon this mine consists of an incline shaft sunk to a depth of 90 feet, following the incline of the ledge. At the bottom of this shaft they have a body of ore three feet thick; having only the hanging wall in sight, the ledge matter is not known. At a depth 50 feet on the incline, a body of ore over five feet thick is in sight; the company have on their dumps about 40 tons of ore that will mill over $80 per ton. The character of the ore is similar to that of the Pine Nut mine.

The next claim is the McGary mine, an undeveloped location, owned by some six parties; it contains 1,500 feet. Next adjoining the McGary on the north is the

CHANCE MINE,

Owned by CURTIS MCGARY & Co; it contains the same number of feet as the Tea Cup mine. This mine is looked upon with considerable favor in Cherry Creek District. The development consists of one shaft down 45 feet, and an incline down 20 feet, following the dip of the ore body, which is the same as in the "Tea Cup." In the incline, an ore body is exposed, over three feet wide, of a very fine character. There are now 50 tons of ore on the dumps of this company that were extracted in sinking the incline shaft and incline, that will pay from $30 to $4,000 per ton. The ledge matter on the croppings shows an average width of over 15 feet. Extending north from the Chance mine, there are some six other locations between it and the Baltic, among which are the Vulcan and Wanderer No. 2. But little development has been made on either of them.

THE BALTIC MINE,

Located on the same belt as the Tea Cup mine, is situated two and a half miles north of it, at the upper or extreme west end of Silver Canyon, and at an elevation of over 8,000 feet. This location is owned by Messrs. WHITEMAN, MASEY and GOODRICH. The claim is 1,500 feet in extent, running north and south, and dipping to the west at an angle of about 50°. The development on this mine consists of an open cut run across the vein near the center for about 50 feet; at this point the ledge is full 60 feet between the walls, all showing more or less mineral. Some 30 tons of pay ore have been taken out, and are now on the company's dump. This is divided into three classes; the first class ore will mill from $300 to $350, the second class $80 per ton; the third class, paying less than $80 per ton, is thrown over the dump.

At the north end of this location, a shaft is sunk to a dept of about 20 feet. In sinking the shaft, a body of chloride ore 8 feet thick was exposed, assays from which show it to contain $20 in silver and $25 per ton in gold. About 10 tons of this ore are now on the dump, at the North Shaft. This mine is now under lease to Captain HENRY CHEEVER, of your city, with privilege to purchase.

Silver Canyon, in which the above claim is located, contains some of the finest timber to be found in Eastern Nevada. Next to the Baltic on the north is the

WANDERER MINE,

The property of SMITH, MCPHERSON, MARTIN and WILSON. These gentlemen claim 1,500 feet on the north of the Baltic. The development on the same consists of a shaft sunk to a depth of 25 feet, and at a point abont 400 feet from their south line. This shaft is sunk on a line with their foot wall, and shows a body of ore of high grade, the entire width of the shaft. The width of their ledge at this point, on the croppings, is about 20 feet; in every other respect it is similar to the Baltic mine. The Wanderer has 25 tons of ore on the dumps.

FORTUNA MINE.

This mine is located about 300 feet northeast of the Tea Cup mine, and upon a parallel ledge, and still different from either of the above described. This location contains 900 feet on the ledge, and is owned by the Messrs. COLLINS and FRANKS. The ore body is between walls of limestone, and shows an average width of three feet. The company have run an open cut upon their ledge, and sunk a shaft 35 feet deep, taking out about 20 tons of ore, which are now on their dumps. It is expected to average $100 per ton.

STAR MINE.

This location is 1,500 feet in length and is the property of Messrs. MOORE and JOHNSON. It is situated in quartzite, about a quarter of a mile east of the Exchequer and below and east of all of the above mentioned mines. It has been worked but slightly, but enough to reveal an ore body three feet thick, similar in character to that of the Exchequer. Some four miles south of Cherry Creek is another mining district that has been known and worked for the last eight or ten years, known as, and located in

EGAN CANYON.

The mines in this district were first discovered in 1863. Two companies were at work in 1865, the Social Co., and the Steptoe Mining Co., which were consolidated in

1866. The principal mine that has been worked since that time is the Gilligan, which has a shaft down 460 feet with levels run east 500 feet, and west 450 feet from the 300-foot level, where it connects with the air shaft; both shafts are inclines run down upon the ledge, which is remarkably well defined. The hanging wall is slate and the foot wall of quartzite; they are cut in a remarkably smooth manner, looking in places as though they had been plastered. There is a five-stamp mill belonging to the company, which during the prospecting of the mine milled about $80,000 out of this rock, paying all expenses. The water came in at a point where the ledge was broken at a depth of 360 feet, and drove them out.

A twenty-stamp mill was erected, but the ore was found to require roasting; while awaiting the erection of a furnace, the mine changed hands and is now being worked by a corporation known as the San José Co. A drift was run into the hill fifty feet below the break, and the ledge found again. The incline was continued down ninety feet, the water being kept down by steam pumps, and a drift run for the ledge, which, when struck, opened such a vein of water that the pumps became useless. The work is now suspended awaiting larger pumps.

SCHELL CREEK DISTRICT.

This district comprises the towns of Shellbourne, Ruby Hill and Centerville. The larger of these places is Schellbourne. At this writing it is extremely dull, and has less than one hundred inhabitants. It is located in White Pine County, Nevada, and distant ninety-five miles from Hamilton, the county seat, and 110 miles south of Wells' Station on the C. P. R. R., between which places WOODRUFF & ENNOR'S stages ply twice a day, making the trip in forty-eight hours. The fare is $20. The cause of the failure in this district, (if failure it is,) can be summed up in two transactions, the first of which was the bonding of all the principal mines on

RUBY HILL,

To Col. O'CONNOR SYDNEY (since deceased) who became involved with English capitalists to such an extent that Mr. THOMAS SNOWDON was sent out to take charge of these mines as their property. Lawsuit after lawsuit has been the result, and it is still in ligitation. The town of Ruby Hill, as a natural result, became depopulated, and those having other locations that were good could not dispose of them, nor induce capital to come to their aid. I venture the assertion that there are to-day just as good mines to the extent of their development at Ruby Hill as anywhere in the new districts of Eastern Nevada. The second and principal cause of the failure was the sale of the

TEHAMA PROPERTY

To TREAT, BOGGS, RICHARDSON & Co., for $28,5000; and they spent $75,000 more for a 30-stamp mill, before they had prospected to a sufficient depth to know that they had a mine. This location, it appears, proves to be a slide of ore from some point higher up in the mountain, and is very rich on the croppings, which were from 10 to 60 ft. wide, but only went down from a few inches to four or five feet. The Queen Springs mines, the Nutmeg and the McMahon are still driving ahead, and extracting some good ore.

ROBINSON DISTRICT.

This mining district is about ten miles long by eight wide, the length being east and west. The mineral-bearing ground lies on both sides of a small valley which has the same name as the district. The ores found here are quite numerous. I will mention some of them in order of prominence: silver (chloride and bromide), gold (telluride and free), lead, copper, iron and graphite. But small quantities of the two latter substances are found. Black and red garnet are found in profusion, some of them are very beautiful. In the center of Robinson District is

MINERAL CITY,

A place of about 250 inhabitants. This town began its existence in April, 1872. Discoveries, however, were made in 1868. There are a ten-stamp quartz mill and a smelting furnace in course of erection. A public school was started three months ago. The town has nearly doubled in size since last year. The mines never looked so prosperous as now, though the scarcity of money makes it rather dull here. Following are the principal mines of the district, with their present state of development:

CANTON M. CO.

This is an Ohio incorporation. Mr. G. M. OGDEN is superintendent. The company own some forty different locations or ledges. The following are the principal, and developed more or less: Minnie-Minora, Blackstone, Yellowstone, New York, Springfield, El Dorado, Randolph, Hayes Extension and Aultman. The latter is the most thoroughly developed, and has the largest body of ore in sight underground of any mine I have ever been in, except those on the Comstock lode. The location known as the

AULTMAN MINE,

With its extensions, is 6,000 feet in length, 2,200 in width, 1,500 feet of which, together with the mill site, is covered by U. S. patent. This claim is located on the south side of Robinson Valley, below Mineral City and in close proximity to the company's smelting works. This mine is being developed by a tunnel now in 750 feet, and about 200 feet below the croppings.

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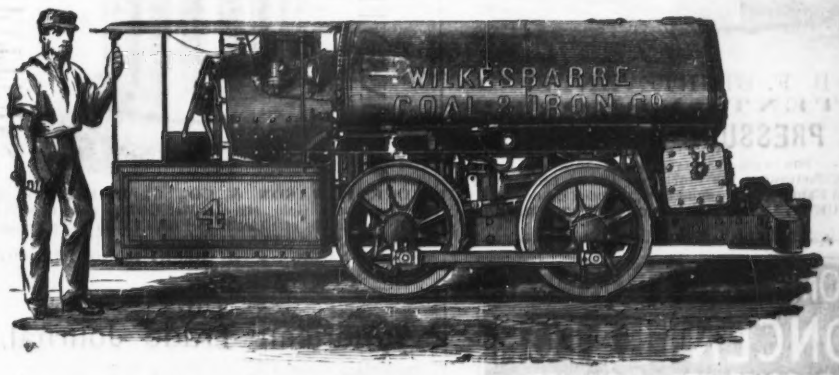

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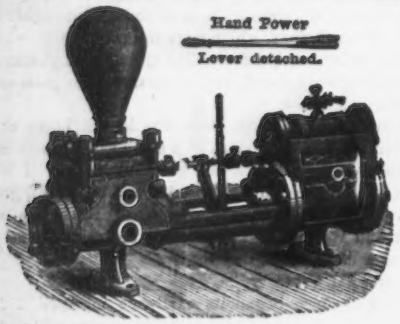

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Minerals and Ores in which the difference of specific gravity is so slight and which are also sometimes in such fine particles as to defy separation by any other machinery or method, are rapidly separated by this Concentrator.

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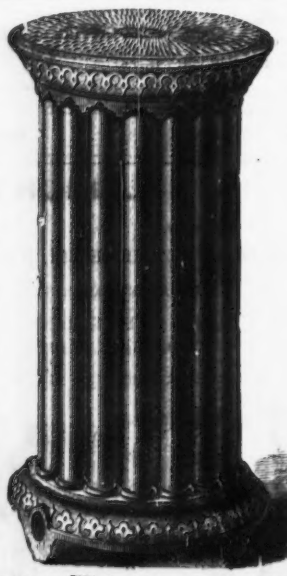

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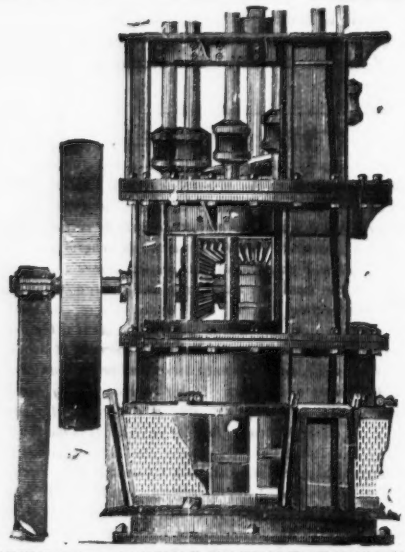

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MISCELLANEOUS.

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Patented

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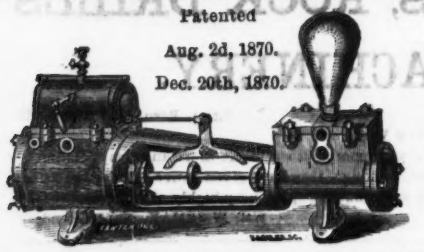

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May 27-Sept. 10

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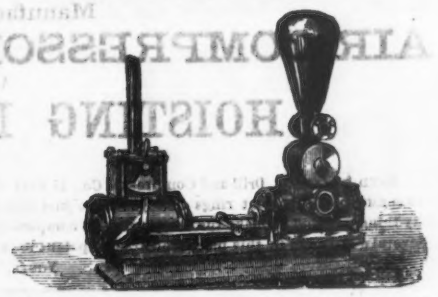
STEAM PUMPS.

Niagara Steam Pump Works.



This Pump has taken the first premium at every Fair in the United States where there has been a practical test.

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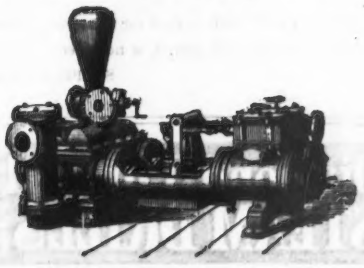

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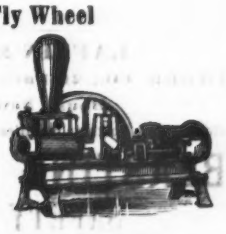

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HOISTING MACHINERY.

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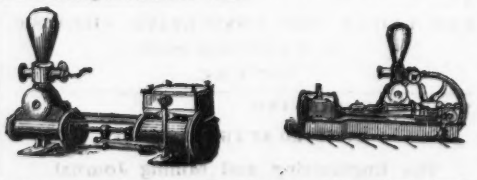

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